

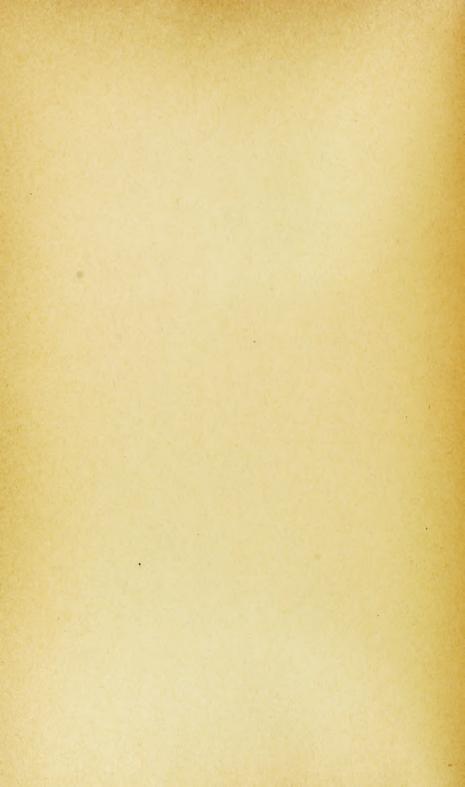


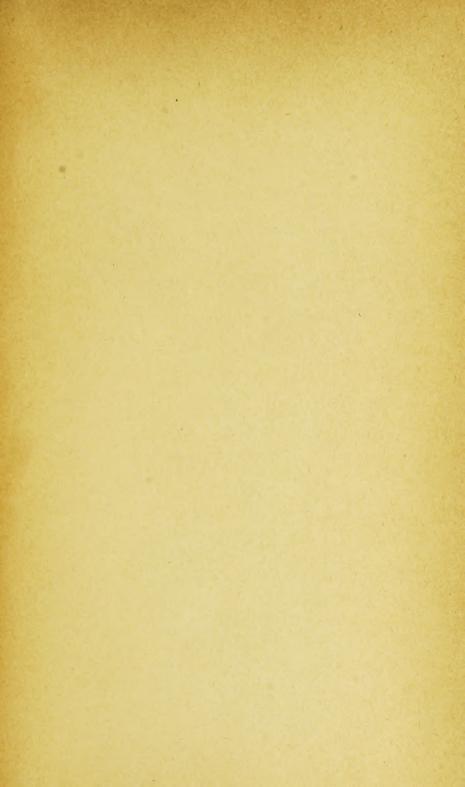
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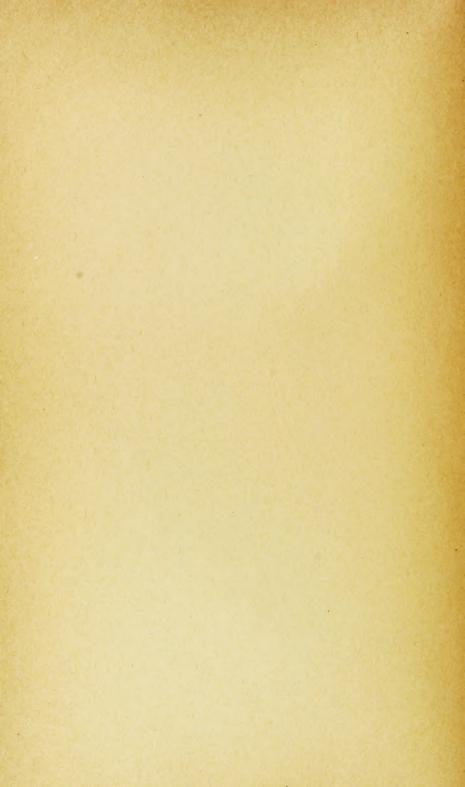
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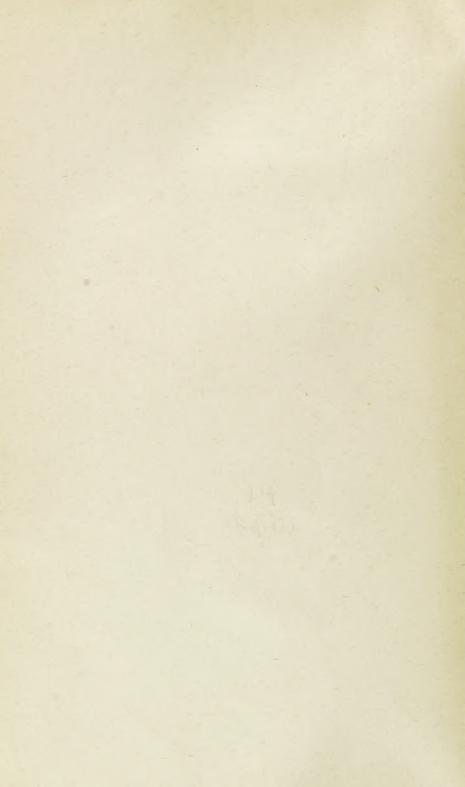
NEW HAVEN DENTAL ASSOCIATION











THE

DISEASES OF INFANCY AND CHILDHOOD

FOR THE USE OF STUDENTS
AND PRACTITIONERS OF MEDICINE

BY

L. EMMETT HOLT, M.D., Sc.D., LL.D.

PROFESSOR OF DISEASES OF CHILDREN IN THE COLLEGE OF PHYSICIANS AND SURGEONS (COLUMBIA UNIVERSITY), NEW YORK; PHYSICIAN-IN-CHIEF TO THE BABIES' HOSPITAL, NEW YORK

AND

JOHN HOWLAND, A.M., M.D.

PROFESSOR OF PEDIATRICS IN THE JOHNS HOPKINS UNIVERSITY, BALTIMORE;
DIRECTOR OF THE HARRIET LANE HOME; PEDIATRICIAN-IN-CHIEF TO
THE JOHNS HOPKINS HOSPITAL



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PREFACE TO THE SEVENTH EDITION

In this Security Ediction the authors have endeavored to bring the book abreast of the assence of the day. In the five years which have clapsed since the last revision there have been great advances in our answholge of many of the subjects which are considered in a general textbook upon Pediatrias. The endeavor has been made to introduce this new knowledge without greatly changing the general arrangement of the book. To do this without increasing the size of the volume has made it necessary to cut out nearly one hundred pages of sid material, and to condense other portions of the look. It is believed that this has been done without impairing the value of the chapters which have been abridged. The decision of the publishers to make entirely new plates has made this comparatively cary.

There is scarcely a page in the book but has been subjected to revision. Sixteen new articles appear for the first time in this edition. The more important ones are Acidesis, Neuropathic and Exedutive Disthesis, Cardiar Arrhythmia. Acute Lymphatic Leukemia, Banti's Discuss, Osteogenesis Imperfects, Still's Discuss, Syphilis of the Nervous System, Pellagra, Epidemic Catarrh, Deolenal Ulcer, and Idiosyncranics to Food Stuffs.

More than twenty chapters have been almost entirely rewritten, the most important being those upon Birth Paralyses. Milk and Infant Freeling, Digestion in Infancy, Chronic Intestinal Indigestion, Hirschsprung's Disease, Asthma, Accidental Heart Murmurs, Hydronephrosis, Genecoccus Vaginitis, Tetany, Consulsions, Epilepsy, Hydrocephalus, Poliomyvlitis, Diseases of Ductless Glands, Diabetes, Hodgkin's Disease, and Teberculous Adenitis.

Many old illustrations have been omitted and fifteen new ones introduced, all of them from original sources. Especial attention has been devoted by the authors to the newer methods of diagnosis and treatment.

The authors desire to acknowledge the assistance of Dv. N. Curtice Holt in the correction of the proof shorts and the preparation of the index.

> L. EMMETT HOLY, JOHN HOWLAND.



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THE DISEASES OF INFANCY AND CHILDHOOD

PART 1

CHAPTER I

HYGIENE AND GENERAL CARE OF INFANTS AND YOUNG CHILDREN

Tim physical development of the child is essentially the product of the three factors—inheritance, surroundings, and food. The first of these it is beyond the physician's power to alter; the second is largely and the third almost entirely within his control, at least in the more intelligent classes of society. These two subjects, infant hygiene and infant feeding, are the most important departments of pediatrics.

The Care of the Newly-Born Child .- After the ligature of the cord the child should be wrapped in a thick blanket and placed in a warm room. In hospital practice the eyes should be cleaned with absorbent cotton and water which has been boiled, and then two or three drops of a two per cent solution of nitrate of silver, after Crede's method, instilled into each eye by means of a glass rod or eye-dropper. In private practice a ten per cent solution of argyrol may be substituted, unless the mother has had a purulent vaginal discharge, in which case the silver solution should always be used. The both should now be given in a warm room; the body being first oiled thoroughly in order to remove the vernix caseosa and then washed in water at a temperature of 100° F. The mouth should be cleaned with sterile water and a soft cloth, and no violence employed. The cord may be covered with sterilized talcum or bismuth powder, and wrapped in sterile gauge or surgeon's lint. The abdomen should now be enveloped in a flannel band, eight or ten inches wide, and pinned rather smurtly. Before dressing is completed, the shild should be submitted to a thorough examination for injuries received during delivery, congenital deformities, also as to the condition of the respiration, circulation, etc.

After densing, the child should be placed in his crib and covered with blankets, and if the feet are cold, or the fingers and tips a little blue, he should be surrounded by het-water bettles revered with flannel, and placed near, but not in contact with, the body. The crib should be placed in a quiet, darkened room. The young infant should not occupy the same bed as the mother, unless he greatly needs the warmth of her body, other means of artificial heat not being at hand.

The cord should be kept dry and disturbed as little as possible until it talls off. Under ordinary circumstances the cord separates from the fourth to the seventh day, the average being the fifth day. The stump should then be covered with the ateriliced talcom or bismuth powder, and a pad of sterile game about one-fourth of an inch thick and two inches square applied and secured in position by means of the abdominal band. The purpose of this is to prevent unbillical herois. The pad should be continued for the first month. The use of stronger antiscptic dressings than these recommended is consecutor objectionable, since it preserves the cord too long and delays separation. The full bath should not be given until the cord has separated.

The physician should always see to it that the infant cries enough to keep the lungs properly expanded.

The question of food for the newly-born infant is considered in the chanter upon infant feeding.

Bathing.—For the first few months the bath should be given at 98°.

F. The room should be warm, preferably there should be an open fire. The bath should be short and the body dried quickly, without too vigorous rubbing. The addition of salt to the bath is an advantage where the skin is unusually delicate or encoriations are present. One large handful should be used to a gallon of water. By the sixth month the temperature of the bath for healthy infants may be lowered to 95° F., and by the cod of the first year to 90° F. Older children who are healthy should be sponged or douched for a moment at the close of the tepid bath with water at 65° or 70° F. During childhood the warm bath is preferably given at night. In the morning a cold sponge bath is desirable. This should be given in a warm room and while the child stands in a tab partly filled with warm water. This cold sponge should hat but half a minute, and be followed by a brisk rubbing of the entire hody.

In some young infants and even older children there is no proper reaction after the both, even whom given at the temperatures mentioned; children being pale, slightly blue about the lips and under the eyes. All tab bathing, and especially all cold bathing, should then be stopped, since a continuance can only be a drain upon the child's vitality.

Clothing: The clothing of infants should be light, warm, non-irritating to the skin, and lesse enough to allow free motion of the extrem-

ities; nor should bands be pinned so tightly about the trunk as to embarrass the movements either of the chest or of the abdomen. The chest
should be covered with a woollen shirt, high in the neck and with long
sleeves. All petticents should be supported from the shoulders and not
from waisthands. Cauton flamed and stocking are both superior as
absorbents to the more commonly used linen dispers. Stockingt has the
advantage of being very soft and pliable. Care should be taken that in
infants the feet be kept warm. If the circulation is very poor, a hag of
hot water should always be in the crib. Chilling of the surface is sometimes responsible for attacks of colic.

The abdominal band is usually worn during infancy. It cannot be considered in any sense a necessity after the first few months, except in cases of very thin infants whose supply of fat in the abdominal walls is an insufficient protection to the viscera. For the first few weeks a band of plain flannel is to be preferred; later, a knitted band with shoublerstraps. The fashion of low neck and short sleeves for infants and very young children has fortunately passed away—let us hope, not to return.

During the summer the outer clothing should be light and the under clothing of the thinnest flamed or game. The changes in the temperature of meening and evening may be met by extra wraps. The custom of allowing young children to go with begs have has many enthusiastic advocates; while it may not be objectionable during the heat of summer, its advantages at any senson are very questionable in a changeable climate like that of New York or the Atlantic coast. Many delicate children are certainly injured by such ill-advised attempts at hardening.

The night elething of infants should be similar to that worn during the day, but should be loose, the material being of the lightest flamed. The night clothing for older children should consist of a thin weedlen shirt and a union suit with waist and trousers, and in some cases with feet, if there is a tendency to get outside the coverings. The common mistake is to overload all children, but especially infants, with covering at night. This is an explanation of much of the restless sleep which is seen, particularly in delicate children.

Care of the Eyes.—During the first few days at the daily bath the eyes should be cleamed with a saturated solution of boric acid. They should be carefully protected from too strong light during early infancy. It is desirable that a child should always sleep in a darkened room,

Care of the Mouth and Teeth.—The mouth of the newly-born infant should be gently cleaned at each morning both with boiled water and a soft cleth. On the first appearance of thrush the mouth should be washed after every feeding with a solution of bicarbonate of sods or boric acid (ten grains to the sunce). It should be applied with a swab made by twisting a bit of cutton upon a wooden teethpick, and not by the name's farger. Harm is often done by the use of too reach real in

cleansing the mouth of a young infant.

The primary teeth as well as those of the permanent set should receive daily attention. Too often they are neglected altogether. Dirty toeth are likely seemer or later to become carious; and carious teeth, besides being a cause of had breath and pain, are a constant memore to the health of the child, since they are frequently the cause of severe infections. Such teeth should either be filled or removed.

Care of the Skin.—The skin of a young infant is exceedingly delicate, and excertations, intertrige, and excent are of very common occurrence. These conditions are much easier of prevention than of cure. The first essential in the care of the skin is cleanliness, and this must be accured without the use of strong coaps or too much rubbing. Napkins must be removed as seen as sailed or wet. Some bland absorbent powder, like starch, talcum, or the stearate of sinc, should be used in all the folds of the skin, in the neck, in the axillae, groins, and about the genitals, and in the folds of the thighs, particularly in very fat infants. If plain water produces an undue amount of irritation, the salt or bran bath should be employed.

Care of the Genital Organs.—The female genitals need but little attention in young children, except as to cleanliness. This is more often

neglected in older children than in infants,

In males the prepace should receive attention during the first few weeks of life. If the foreskin is long and the preputial orifice small, circumcision should be done. If it is not long, but is only adherent, these adhesions should be broken up, the parts thoroughly cleaned and the foreskin retracted daily until there is no disposition to a recurrence of the adhesions. These operations will be discussed more at length in a subsequent chapter. The only thing to be emphasized in the present connection is that the prepuce should receive proper attention in early infancy, since this can now be done with less pain and discomfort to the child, and at the same time better results are obtained. If this matter is neglected during infancy, it is apt to be overlooked until harm has been produced by local or reflex irritation which phimosis or adherent prepuce may have excited.

Vaccination.—This, although considered elsewhere, should be mentioned in this connection as among the things requiring the physician's

attention during the first months of life.

Training to Preper Control of Rectum and Bladder.—It is surprising to see what can be accomplished by intelligent efforts at training in these particulars. An infant can often be trained at three months to have its movements from the bowels when placed upon a small chamber. This not only saves a great amount of washing of napkins, but there is soon formed a habit of laving the bowels more at a regular time or times each day. The infant must be put upon the chamber soon after his feeding. The importance of training young children to regular habits regarding evaruations from the bowels can hardly be overestimated. It should be impressed upon every mother and nume by the physician, and especially the necessity of beginning training during infancy. Much of course will depend upon the food and the digestion; but habit is a very large factor in the case.

The training of the bladder is not quite so important, but the proper education of this organ adds much to the comfort of the child and the case with which he is cared for. Before the end of the first year many intelligent children can be trained to indicate a desire to empty the bladder. Many mothers and nurses succeed in training children so well that by the tenth or eleventh month naphins are dispensed with during the day. On the other hand, it is very common to see children of two and even two and a half years still wearing naphins because of the lack of proper training. Before he has reached the age of three years a healthy child will nearly go from 10 p.m. until morning without emptying the bladder. The annayance and discomfort from the neglect of early training in this particular are very great. Night feeding is responsible for much of the difficulty experienced in training children to hold the water during the night.

General Hygiene of the Nervous System.—Great injury is done to the nervous system of children by the influences with which they are surrounded during infancy, especially during the first year. The brain grows more during the first two years than in all the rest of life. Normal healthy development of the nervous centers demands quiet, rest, peaceful surroundings, and freedom from everything which causes excitement or undue stimulation.

The steadily increasing frequency of functional nervous diseases among young children is one of the most powerful arguments for greater attention by physicians to the subject of hygiens of the nervous system during infancy. Most parents err through ignorance. Playing with young children, stimulating to laughter and exciting them by sights, sounds, or movements until they shrock with apparent delight, may be a source of amusement to foud parents and admiring spectators, but it is almost invariably an injury to the child. This is especially harmful when done in the evening. It is the plain duty of the physician to enlighten parents upon this point, and insist that the infant shall be kept quiet, and that all such playing and romping as has been referred to shall, during the first year at least, be absolutely prohibited.

Step.—The elecp of the newly-born infant is profound for the first two or three days and under normal conditions almost continuous. In the case of prolonged or bolious labor, or where from any cause undue compression has been exerted upon the head, it may approach the condition of semi-come for (wonty-four or forty-eight hours. This may be so deep as to exent approheusions of serious heats lesions. If, however, there are associated with it no contubuous and no rigidity, this early

stuper usually passes away on the second or third day.

The sleep of early infancy is quiet and peaceful, but not very deep after the first mently. After the third year the heavy sleep of childhood is commonly seen. A healthy infant during the first few weeks sleeps from twenty to twenty-two hours out of the twenty-from waking only from hunger, discondert, or pain. During the first six mouths a healthy infant will usually sleep from sixteen to righteen hours a day, the waking periods being only from helf an hour to two hours long. At the age of one year most infants sleep from fourteen to fifteen hours, viz., from eleven to twelve hours at night, and two or three hours during the day, usually in two maps. When two years old usually thirteen to fourteen hours' eleep are taken; eleven or twelve hours at night and one or two hours suring the day, generally in a single tup. At the age of four years children require from eleven to tweive hours' sleep. It is always desirable, and in most cases with regularity it is possible, to keep up the daily nap until cheldren are five years old. From six to ten years the amount of sleep required is ben or eleven hours, and from ten to sixteen some nine hours should be the minimum.

Training in proper habits of sleep should be begun at both. From the outset an infant should be accustomed to being put into his crib while awake and to go to sleep of his own accord. Rocking and all other labits of this sort are useless and may even be harmful. An infant should not be allowed to sleep on the breast of the nurse, nor with the nipple of the bottle in his month. Other devices for putting infants to sleep, such as allowing the child to suck a rubber nipple or anything else, are positively injurious. If such means of inducing sleep are resorted to the infant soon requires the liabit of not sleeping without them. We have known of one instance where the liabit of rocking during sleep was continued until the child was two years old; the moment the rocking was stepped the infant would wake, and in consequence this practice was continued by the devoted but misguided parents. A quiet, darkened room, a want and confortable bed, an appetite satisfied, and dry napkins are all that are needed to induce sleep in a healthy child.

The periods of sleep in young infants are usually from two to three hours long, with the exception of once or twice in the twenty-four hours, when a long sleep of five or six hours occurs. The purpose of training is to have the child take this long sleep at night. The habit of regular sleep is lest established by wakening the infant regularly every three of four hours during the day for feeding, and allowing him to sleep as long as possible during the night. This training goes hand-in-hand with regular habits of feeding. Such habits are easily formed if the plan be systematically followed from the outset.

By the fourth month all feeding between 10 r.m. and 6 a.m. should be discontinued. If this is done most infants can be trained by this time to sleep all night. If the room is lighted, and the child taken from the crib or rocked or fed as soon as he wakens at night, there is no such thing as the formation of good habits of sleep. Regularity in sleep and feeding not only makes the care of young infants very much easier, but is of a good deal of importance for the health of the child.

The causes of disturbed or irregular sleep in using infants are mainly two—hunger and indigestion. In nursing infants it is usually the former; in those artificially fed usually the latter. Steeplessness from hunger is often seen in children who are nursed thirty or forty minutes and then fall askep, but wake in fifteen or twenty minutes crying and fretful. After being quieted they may fall askep again for half an hour, but wake at short internals. The peaceful sleep of two or three hours which should follow a proper feeding is never seen. With this restlessness from indigestion other signs are usually present, stationary weight, etc. The disturbed sleep due to overfeeding shows itself by much the same symptoms, except that the first sleep after the meal is usually longer.

Exercise.—This is no less important in infancy than in later childhood. An infant gets his exercise in the Insty cry which follows the coal sponge of the bath, in kicking his legs about, waving his arms, etc. By these means pulmonary expansion and muscular development are incrossed and the general nutrition promoted. An infant's clothing should be such as not to interfere with his exercise. Confinement of the legs should not be permitted. In hospital practice we have often had a chance to observe the had results which follow when very young infants are allowed to lie in the cribs nearly all the time. Little by little the vital processes flag, the cry becomes feeble, the weight is first stationary, then there is a steady loss. The appetite fails so that food is at first taken without relish, then at times altogether refused; later, vomiting ensues and other symptoms of indigestion. This, in many cases, is the beginning of a steady downward course which goes on until a condition of hopeless marasmus is reached. Such infants must be taken up every few hours and carried about the wards; the position should be frequently changed, and general friction of the entire body employed at least twice a day. Every means must be made use of to stimulate the vital activity. The value of systematic attention to these matters cannot be overestimated in hospitals for infants. Infants who are old enough to creep or stand usually take sufficient exercise unless they are restrained. At this age

they should be allowed to do what they are rager to do. Every facility should be afforded for using their massles. Exercise may be encouraged by placing upon the floor in a warm room a mattress ar a thick "comfortable," and allowing the infant to roll and tumble upon it at will. A

large bed may answer the same purpose.

In older children every form of out-of-door exercise should be encouraged—hall, tennis, and all running games, horseback riding, the hicycle, tricycle, extinming, coasting, and skating. Up to the eleventh year no difference need be made in the exercise of the law-seres. Companionship is a necessity. Children brought up alone are at a great disadvantage in this respect, and are not likely to get as much exercise as they require. The amount of exercise allowed delicate children should be regulated with some degree of care. It may be carried to the point of moderate numerical fatigue, but never to muscular exhaustion. The latter is particularly likely to be the case in competitive games.

Exercise should have reference to the symmetrical development of the whole body. In prescribing it the specific needs of the individual child should be recordered. By carefully regulated exercises very much may be done to check such deformities as round shoulders and slight lateral curvature of the spine, and also to develop narrow cheets and feeble thoracic muscles. For purposes like these, gymnastics are exceedingly valuable to supplement out-of-door exercise, but they can never take their

place.

There are two important points with reference to exercise indoors. First, the playroom should be coel—about 60° F. Secondly, during all active exercise the clothing should be loose and light, so as to allow the freest possible motion of the body.

Airing.—In summer there can be no possible objection to a young infant being allowed out of doors at the end of the first week. He should he kept in the open air as much as possible during the day. In the fall and spring this should not be permitted until the child is at least a month old, and then only when the out-of-door temperature is above 60° F. Ourning his sisting the head should be protected from the wind and the eyes from the sun. The duration of the suting at first should be only fifteen or twenty massites, the time being gradually lengthened to two or three hours. The child should be gradually accustomed to changes of temperature in the room by opening wide the windows for a few minutes such the even before he is taken out of doors, the child being dressed meanwhile as for an estring. In the case of children born late in the fall or in the winter this means of giving fresh air may be advantageously lagan at one menth and followed throughout the first winter. It is only percenty in all such cases that the changes be made very gradually both as to the length of the suring and as to the temperature. The great advantage of this plan over that more commonly followed of keeping young infants closely housed for the first six months in case they are horn in the fall or early winter, we can positively affirm from quite a wide observation of both methods. It is a matter of very serious importance that every infant be furnished an abundance of pure fresh air in winter as well as in summer. When the plan above outlined is carefully and judiciously followed, the tendency to entarrhal affections instead of being increased is thereby greatly bessened.

When four or five months old, there is no reason why a healthy child should not go out of doors on pleasant days if the temperature is not below 20° F. While there is a prejudice on the part of many mothers and some physicians against a child's sleeping out of doors in celd weather, it is a practice which we have always orged upon mothers, and have never seen followed by any but the most beneficial results. The days of all others when infants and very young children should not be out of doors are when there are high winds, especially those from the northeast, an atmosphere of melting snow, and during severe storms. Delicate infants must of course be more carefully guarded during the celd season. With most of these the plan of house-airing is all that should be attempted.

Nursery.-This should be the summest and best-ventilated room in the house. It is the physician's duty to see that proper attention is paid to the hygiene of the room in which the child spends at least four-lifths of his time during the first year, and two-thirds of his time during the first two or three years of life. Semlight is absolutely indispensable. Sunny rooms always contain less organic matter and less humidity, and better a room upon the north side of the house should always be neuided; perferably one in the second story should be chosen. Nothing which can in any way contaminate the sir of the room should be allowed. There should be no washing and drying of clothes or of mpkins. No food should be allowed to stand about the room. Gas should not be allowed to burn at night; a small wax night-light furnishes all that is needed in the nursery. If possible the heat should be from an open fire; the next best thing is the Franklin heater. Nothing in the room is worse than steam heat from a radiator unless it be a gas store, which under no circumstances should be allowed, except possibly for a few minutes each morning during the bath.

The temperature of the room during the day should not be over 70°.

F. It is important that every nursery should have a thermometer, and that this and not the sensations of the nurser should be the guide. It is almost invariably true that the nursery is overheated. Often no other explanation can be found for chronic indigention and falling weight excepting a nursery whose habitual temperature ranges from 75° to 80°.

F. At night for the first few weeks the temperature should not be allowed to full below 65° F. After two mouths the night temperature may full to

5000 or even 100 F.

Free ventilation without draughts is an absolute necessity. This is best accomplished by ventilators in the windows, of which there are many excellent devices sold in the shops. While the child is absent from the room the windows should be widely opened and free arrang of the nursery accomplished. The room should always be thoroughly mired at night before the child is put to bed. After the first year the window may be open, unless the outside temperature is as low as 20° F. If the window is open the door of the nursery should be closed, that currents of air may be avoided. The ventilation by means of an open fire is the most efficient.

The farmiture of the nursery should be as simple as possible, heavy hangings should be positively fortiolden, and upholstered farmiture used only to a small extent. Plears covered by large rugs are much more

cleanly than carpets, and hence are to be preferred.

The child, whenever it is possible, should have a separate bed; and so should the newly-horn infant, in order to prevent the danger of overlying by the mother, which is seen as an occasional came of death, and also to avoid the danger of too frequent night nursing, which is injurious alike to mother and child. Separate beds for older children will prevent the spread of many forms of infection. The crib for infants should be one which does not rock, in order that this unnecessary and vicious practice may not be carried on. The mattress should be of hair and quite firm. The pollow should be small; in the summer, hair pillows are an advantage but not a necessity. The position of the child during sleep should be changed from time to time from one side to the other and then to the back. Attention to all these details should not be beneath the physician's notice, since the violation of those plain rules of hygiene is at the bottom of many of the milder disorders and even of some of the more serious diseases seen in infance.

The Narse.—The nurse of a young child should be healthy, young or in middle life, free from (observations or syphilitie taint, from ratarrial affections of the nose and threat, and not of a nervous or excitable tereperament. She should be next in habit, of quiet disposition, and, most

of all, she should be a person of intelligence.

The Amount of Air Space Required by Infants.—The nursery should always be as large a room as possible. One of the reasons why young infants do so hadly in institutions is because of overcrowding. In a well-ventilated ward there should be allowed to each infant at least 1,860 cubic feet. Children over two years old are not so sensitive to their surroundings, and may thrive in wards where only 700 or 800 cubic feet are allowed to each shild.

THE CARE OF PREMATURE AND DELICATE INFANTS

Infants been before term, and some exceedingly delicate ones who are been at full term, require very special and particular care. The vitality is so feeble in these shifteen that if they are handled in the sedimary way they survive at most but a few weeks. The symptom which indicates that such special care is necessary is most of all the weight of the child. Either congenital feebleness or prematurity may be assumed in most of the children weighing less than five pounds; also if the length of the body is less than nineteen inches. In these children all the organs are likely to be imperfectly developed and they are not ready for their work. Especially is this true of the lungs and of the organs of digestion-

The clinical picture presented by these cases is quite characteristic. The body is limp; the skin very soft and delicate and almost transparent; the cry, a low feeble whine not unlike the mew of a kitten; the respiratory movements, extremely irregular, sometimes scarcely perceptible for several seconds; the movements of the extremities infrequent and never vigorous. The general appearance is one of torpor. The muscles of the mouth and check and tongue may lack the requisite force for sucking, so that this is practically impossible, and even deglishinous is slow, difficult, and prolonged. It is difficult to maintain the normal body temperature; unless closely watched this may fall far below the normal, and may rise quite as much above it with the use of too much artificial heat. We once saw a fluctuation of 13° F, occur in a few hours from such causes. All the symptoms mentioned vary much according to the degree of prematurity.

In the management of these cases there are three problems to be solved: the first to maintain the animal heat, the second to nearish the infant, the third to prevent infection. Difficult as it always is to rear a premature infant, these difficulties are much increased in cases where proper means are not adopted immediately after birth. The loss which these children sustain during the first few days is in very many cases so great that subsequent measures, however well carried out, are futile. The heat-producing power is so feeble that the body temperature quickly falls below normal unless artificial heat is constantly used. The effect of cold upon these delicate infants is very serious, and not only growth but even life depends upon maintaining the body temperature steadily and uniformly. Their extrems assorptibility is something which it is difficult for one to appreciate who has not had experience in these cases.

One of the simplest means of maintaining the temperature is to oil the skin and then roll the entire body, including extremities, in absorbent cotton or lamb's wook; even the neck and cranium may be covered, leaving only the face exposed. The usual disper may be replaced by a pad of game and absorbent cotton. The body is then wrapped in blankets, placed in a clothes-basket or businet with perioded sides, and surrounded by bottles or bags containing hot water. A blanket or sheet should partially cover the top of the basket, forming a sort of tood to protect the eyes from light and the face and head from draughts. In using het-water bags, some caution must be exercised or too much heat may be secured. We have seen the temperature of an infant raised six or seven degrees from this range. The temperature of the child should at first be taken every few hours to make sure that a proper amount of external heat is supplied.

A more efficient means of furnishing artificial heat is by the electric pad. These small heaters may be attached like a drop-light to any electric fixture. A convenient size is ten by fiftures inches. The pad, which can be obtained of any electric supply company, is placed beneath two or three thicknesses of blanket, upon which the infant lies in its basket. Since the pads occasionally get out of order they must be used with some contion, so they have been known to burn the bedelothes and

even the haby.

With such means as those described it is possible to maintain the body temperature at normal even in a room kept at the ordinary temperature. It is preferable to have a warmer room; 80° or even 85° F. is desirable for feeble infants. Adequate ventilation, however, is indispensable. With intelligent care excellent results can, however, often be obtained with no other means for maintaining heat than the pudded basket and hot-water bottles; but the other accessories make the problem an easier one.

Premature infants should be fed without being removed from the basket, until they are strong enough to take the breast. The position should be frequently changed and some freedom of movement of the limbs permitted, but the infants should be handled as little as possible. The body should be offed and fresh cotton applied every other day. The rectal temperature at first should be taken several times a day in order to be sure that sufficient artificial heat is being supplied, but not too much. The latter condition is one that often obtains. So long as the rectal temperature varies only between 98° and 100° P, one should be satisfied.

Insubators.—Personally, we have not found the usual small insubator a very satisfactory means of caring for the premature infant. The difficulties in successful operation are many and the dangers consequent upon the mode of ventilation are considerable. Except by persons experienced, their use is not to be advised. In hospitals with specially trained numes they may give excellent results, but in the average home the simpler measures above described are much safer and quite efficient,

Every institution receiving and caring for premature infants should have a specially equipped room for that purpose. It should be of suffieient size to accommodate several patients. We have had such a room constructed in the Babies' Hospital which seems to fulfill all the requirements. The room has a floor space of tharteen by sixteen feet with ceiling eleven feet high. This is arranged for five infants, which gives each shild 450 subic feet of air. The crobs are separated by glass plates, which project three feet from the side wall and are four feet in height, forming an alcore for such infant. The purpose of this is to diminish the chances of bed-to-bed infection. The room has double partition walls and double windows. The temperature is controlled by a thermostat regulator and is maintained at about 20° F. The room is provided with a special ventilating apparatus by means of which the entire air of the room can be changed in a few minutes. This is done several times a dar. Such a room possesses all the advantages of the small incubator without any of its drawbacks. The infants are clothed in a single loose garment. of absorbent cotton and cheese-cloth and lightly covered. In this room the normal body temperature is easily maintained. For wet-aursing, bathing, and changing of markins, the children are removed to an auteroom which is kept at a temperature of about 75° F. When the bottle is given they are fed in their only. After reaching the weight of about free pounds they are removed to the antercom for a few days, after which they are placed in the ward or sent home.

Feeding.-The feeding of the premature infant is not less important. than the maintenance of heat and proper ventilation. Infants at eight months and those weighing five pounds or thereabouts can usually be made to take the breast after the first few days. Few below this age or weight will do so. Some will suck from a bottle, but the majority must be fed by other means. A medicine dropper may be used, or the Brock feeder; the smallest and feeblest, however, must be fed by garage, using a funnel and small rubber cutheter. The food should be slowly given; if rapidly, some is liable to be regurgitated, and this may produce attacks of asphysia or even an aspiration presuments. The quantity of food and frequency of feeding will depend upon the size and age of the child. A seven months' baby weighing three and a half pounds should have, for the first twenty-four hours, only water, one to three teaspeoutule every hour, Then regular food every three hours beginning with half an ounce, increased to one ounce in a few days and gradually to one and a half or two conces at the end of about three weeks.

Artificial feeding is seldom very successful with premature infants.

With some of the larger and more vigorous, cow's milk modified according to the directions given in the shapters on Infant Feeding gives good results. We once successful with a child of three pounds two owners. For

most of them under four and a half pounds, breast-milk is essential. If the child is born near term, the mother may be able to nurse it. Occasionally this may be done at eight months, but undern earlier, so that the milk of some other woman must usually be depended upon.

As the premature buly requires only from six to eight comers of broad-milk a day lise the first few weeks, this may be secured from some other nursing woman; a friend might be willing to furnish it or it could be parelased from any is with a woman who has an abundant supply. It is sufficient if it is drawn fresh twice a day, the utmost precautions, of course, being taken to secure cleanliness. At first equal parts of breastmilk and a four- or five-per-cent solution of milk sugar may be given; the degree of dilution being gradually lessened until pure milk is taken. Right feedings a day are usually necessary, the amount at one feeding may be from two draws to one cance depending upon the size, age, and directive powers of the infant. It is not important that the haby of the woman furnishing the milk should be of the same age as the foster infant. The milk of any woman whose haby is between one and eight months old will answer. We have successfully fed premature infants with breadmilk from women whose children were older than this. Another plan is to secure a wet-nurse and permit her to being her awa baby into the house. She expresses for the premature infant the required amount of milk three or four times a day, and the rest of the time nurses her own child. In this way her flow of milk is maintained; if the breasts are pumped exclusively the supply rapidly diminishes. The secretion of the milk in the mother may be promoted by her suckling the wet-nurse's baby or some other vigorous infant. The above are temporary expedients and in most instances need not be continued more than two or three weeks, at the end of which time the mother may be able to nurse her own child.

The results with premature babbes will depend very much upon how seen after birth they receive proper care. Immediately after birth measures should be taken to secure the best care and provide adequately for

Ale.	Tomics seed without incu- bation	Tarrier excedi	Vanders sand with involvement	Youther sand statisting cases dying a few lames of see herit.
Bom at 6 menths	0.0% 29.0% 29.0% 34.0% 78.0%	16.0% 36.6% 10.6% 17.0% 88.6% 96.0%	22.0% 41.0% 75.0% 79.0%	06.0% 71.0% 80.0% 91.0%

maintaining the body heat. If an incubator is to be used it should be in readiness, so that the child can be port into it as soon as he is breathing properly. The age and rigor of the infant are of the greatest imporWEIGHT 15

tance in estimating the chances of survival. The table on the preceding page gives Tarmier's statistics, showing the percentage of premature infants saved during a period of five years without the incubator, and during the succeeding five years with the incubator; also the percentage saved at the Sloane Hospital for Women (New York), as published by Voorhees.

Besults will improve with the superience of the physician in the feeding and care of these very somitive patients. Much is yet to be learned about them.

CHAPTER II

GROWTH AND DEVELOPMENT OF THE BODY

OBSERVATIONS upon growth and development are of the utmost importance during infancy and childbood. Only by this means are very many diseases detected in their incipracy. Early recognition carries with it in most cases the possibility of checking such pullsdogical processes as, if allowed to go on, may affect the health not only in infancy but even throughout life.

By familiarity with what is normal, detection of the abnormal soon becomes case. Investigation in regard to these subjects should be made a part of the physical examination of every clobs.

WEIGHT

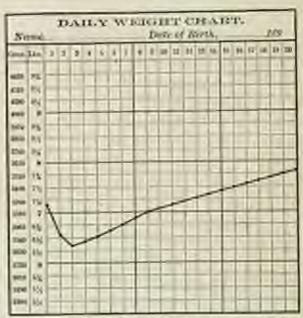
The weight of the infant is the best means we have to measure his nutrition. It is as valuable a guide to the physician in infant feeding as is the temperature in a case of continued fever. Although the weight is not to be taken as the only guide to the child's condition, it is of such importance that we cannot afford to dispense with it during the first two years. It is of great advantage to keep up regular observations during childbook.

Weekly weighings should be made for the first six months, hi-weekly for the rest of the first year, and monthly during the second year. Delscate children should be weighed even more frequently. Balance scales only should be used. The spring scales are not reliable.

Weight at Birth.—The following figures are taken consecutively in nearly equal proportion from the records of the Nursery and Child's Hospital, the Sleane Hospital, and the New York Infant Asylum, and include only full-term children:

Average	weight.	of 568 females.	3	1.19	lbe.	(3.260)	grana,	1
	- 11	500 males	3	5.55	. 41	(3.400	-	h
-	100	1356 infants	2	35	*	(3,330)	-	γ.

Weight Curve during the First Few Weeks.—The accompanying chart represents the variations in weight for the first twenty days. These observations were made upon one hundred healthy, warring infants, fifty males and fifty fermion, at the Nursery and Child's Hospital. The children were weighed shilly during the period of observation. The sugrage weight at birth was 7.1 pounds. The curve shows a very marked loss of weight on the first day and a slight loss on the second day, the lowest point being touched at the beginning of the third day; but from this time there was a steady gain. The average initial loss in



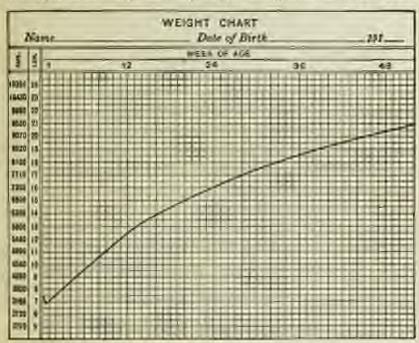
Pea L-Westige Cours or the Poor Twenty Date.

these cases was ten owners, being in such sex exactly eleven per cent of the body weight. In eight hundred and thirty-five cases, including these above mentioned, the average less was nine and a half owners. The loss of the first days is chiefly due to the discharge of the meconium and urine, but is in part from the excess of tissue waste over the nutriment derived from the breasts. After the third day, coincident with an abundant secretion of milk, there is a steady, daily increase in weight. If the milk is very scanty or a wanting altogether, the loss in weight continues.

The birth-weight of nursing children who thrive normally is regained on the average on the tenth day. The most frequent deviation from the normal curve consists in a continued loss or stationary weight after the WEIGHT 17

third day. This may be due to acute illness, but in most cases there is a disturbance of nutrition from improper or insufficient food.

The weight curve of infants who are artificially fed, even though they are strong and vigorous and the feeding properly done, rarely follows for the first mouth the same line as that of nursing infants. We usually see an initial loss which is about the same as in nursing infants, then a period of nearly stationary weight lasting from one to two weeks.



Fro. Z .- Wasser Cours or ran Poser Year.

Weight Curve of the First Year.—The accompanying weight curve is made up from complete charts of about two hundred healthy nursing infants who were thriving and weighed every work, and the incomplete charts of about five hundred other infants. There are represented about thirty thousand observations on shildren under one year. The most rapid increase is during the first three mouths. It is slowest from the sixth to the ninth month. This curve is not to be regarded as a normal line, like that of a temperature chart, but as an average line. An infant who is at hirth a pound above the average rany keep this distance above the line for the whole year; another, weighing one pound less than the average, may be as far below it. Girls throughout the year are on the average half a pound lighter than boys. No single child exactly follows, the line all the way, but it is surprising how close to it many come.

In artificially-fed infants who are healthy and are properly fed, the curve does not differ assentially from that of breast-fed infants, except in the slower gain of the early weeks.

During the first year the healthy child nearly trebles his weight. Perfect health is consistent only with regular gain in weight. The gain may not always be rapid but unless it is steady something is wrong; usually it is the food or the method of feeding. One should not be satisfied unless the weekly gain is at least four ounces. Certain infants fed upon condensed milk or proprietary foods may show rapid gain in weight without other evidence of healthy patrition.

Weight from the First to the Fifth Year.—From about two thousand personal observations, cheefly from private practice, it appears that the normal gain of a healthy child is about six pounds during the second year, about five during the third year, and about four pounds during the fourth year (see table p. 19). After the first year the gain is rarely so regular as during the first twelve months. With most children it is slowest in midennmer and midwinter and most rapid in the autumn. Girls gain at the same rate as boys, but are about one pound lighter. During every form of illness there is less of weight, which is especially marked in disorders of the digestive tract.

Weight of Older Children and Its Relation to Nutrition.-Tim weight of older children must be considered in relation to height rather than age. Too little importance has been attached to weight records throughout the entire period of growth, yet such a record represents the progress of a child in health and growth quite as accurately as during infancy. Regular gain in weight and growth in height are phenomena of normal autrition. Individual variations for a given age are so wide, often amounting in children of the same race and social condition to two or three years' growth, that weight for age is not an accurate way of determining the condition of a child's nutrition. Weight for height is much more important, and is surprisingly little influenced by race conditions. Even here the meetage must not be regarded as the assumed; but any child who is 10 per cent or more below average weight for his height may, for practical purposes, be regarded as undernourished; so may also any child whose annual gain in weight is habitually much below the average. For the physician under whose care children come during their period of growth, knowledge of peoper weight is most essential.

The data for the weight-to-beight table (page 19) are from figures from Bowditch relating to public school children in Boston in 1875. It is our observation and we think that of must pediatrists in the United States that the generation been since 1900 is both taller and heavier than the previous one; this is certainly true of the children of parents born in this country. However, the relationship of weight to height shown in

Average Net Weight, Height and Circumference of Head and Chest of Healthy Children from Birth to Four Years.

70	47	Weight.		Beight		Ch	et.	Head	
Age	No.	Pounds	Kilon	Inches,	Co.	Indea	Cm.	Inches	Co.
Birth	Boys. Gith	7.55	3.43	25.6	52.5 52.6	13.4	34.2 33.0	13.9 13.5	35.2
6 months.	Boys, Girls	16.0	7.26	26.5	(7.3 66.0	16.5	40.8	17.0	43.2 42.3
12 months.	Boys. Girls.	21.0	9.54	29.5	73.7	17.5	45.7 44.6	18.0 17.5	44.5
18 months	Boys. Girls.	24.5 24.0	11 13	32.6 31.4	81.2 79.8	18.7	47.8 46.2	18.6 18.0	45.2
2 years	Boys. Girls.	27.3 26.5	12 40 12.04	34 0 33 4	56-3 51.8	15.3	49.1	19.2 15.6	48.7
2% years.	Boya. Girls.	30.0 20.0	13.63 13.18	36.0	91.5	19.8	50.4	19.5	49.5
Symps	Bons. Girls.	32.5 31.5	14.77 14.31	37.5 37.0	95.4 94.2	20 3 10 8	20.4	19.8	30.4 49.3
years	Boys. Girls	36.8 35.3	16.72 16.04	40.5 40.0	103.0	20.8	52.8 31.6	20.0	50.3

Relation of Weight to Beight!

	- 0	KOY'S.			-an	sta	
Milght. Decises.	Weight. Frank	Increase Per limb, Postula	Appen. Ass. Years.	Histor. Indica.	Weight, Property	larram Per Laph Financial	Approx. News.
24445874688888888888888888888888888888888	41.8 43.6 47.6 49.6 107.1 54.6 107.3 66.2 66.2 66.2 72.7 76.4 80.2 84.0 94.6 95.5 100.5 10	18 20 20 20 20 20 20 20 20 20 20 20 20 20	0 7 9 10 11 12 13	42 44 44 44 44 44 44 44 44 44 44 44 44 4	90 9 42 6 44 5 46 5 46 5 50 7 50 2 50 1 55 8 60 4 64 4 64 5 71 0 74 9 93 3 93 3 93 3 93 3 105 4 115 7	1.7 1.9 2.0 2.0 2.2 2.5 2.7 2.6 3.1 3.5 3.9 4.5 4.5 6.4 5.0 6.6 10.3	0 7 9 10 11 12

From 23,000 observations by Bowdisch. Weights are in lurant clothes; heights are without above.

Bowditch's figures still holds true. As a rule in health increase in weight and growth in height go on together and at the same rate. But the impulse in the young to grow is very great; growth may take place when there is no gain and sometimes even when there is actual loss in weight. After infancy neither growth nor gain in weight is uniform for long periods of time. There are seen with nearly all healthy children periods of quite rapid growth and gain in weight followed by other periods in which both are much slower. Often this occurs without evident cause.

In 200 observations made upon boys from nine to sixteen years in a New York private school the average gate in height was 0.36 inch more, and in weight 1½ pounds more, for the six months from May to November than from November to May; the reason apparently being greater relative freedom from illness and the more out-of-door life of the warm months.

Annual Increase in Weight.—The relation of weight to height is important at any age in determining the status of a child with respect to his nutrition; but nothing so well records his progress in nutrition as his annual rate of gain. Up to the age of ten years the annual gain in weight is nearly the same for both sexes, boys being on the average a pound or a pound and a half begvier than girls. During the eleventh, twelfth and thirteenth years girls gain more rapidly than do boys and pass them in weight. The thirteenth is usually the year of greatest increase. Boys begin to gain rapidly in weight during the fourteenth year and soon pass the girls. With them the sixteenth is usually the year of greatest increase. With both sexes there is seen as a rule a slowing up of growth before the rapid increase of pulserty begins.

Average Annual Increase in Weight and Height!

	101/8	SID	EN.	
.Apr.	Posits.	Inches.	Produ	Zooles.
Sio dyn	4.0	2 0 2 0	4.0	2.0
5 9 4	5.25 6.0	2.0 2.0 2.0	5.0 5.25	2.0 1.73 2.25
10 - 11 - 11 - 11 - 12 - 11 - 12 - 11 - 1	5.0 6.5 8.0	1.7 1.8 2.0	6.5 9.5 10.5	2.6 2.6 2.0
11:11:	10.0 12.5 13.75	2.5	9.5 7.5	2.0 1.25
15 7 100 1 166 + 177 2 17 * 188 *	6.5	1.2	3.5 0.5	0.70

⁸These averages are calculated from about 100,000 observations upon children in public and private schools in the United States, compiled from ten different authors.

HEIGHT

Measurements of 442 infants born at term, taken in about equal numbers from the records of the New York Infant Asylum and the Slome Hospital, gave the following results:

Average l	length o	231	reale infants born at term	20.61	inches	(82.5 cm.) (82.2 *	-
8.		412	infacts	20.54		(\$3.35 *)	1.

During the first year the average normal growth is nine inches (23 cm.). From about twelve hundred personal observations upon children from one to five years old, chiefly from private practice, it appears that during the second year the average growth is four and one-half inches; for the next three years it is about three inches a year. According to Bowditch's figures, thereafter it is about two inches a year up to sleven years in girls and thirteen in boys, when the more rapid growth of puberty begins. Both sexes grow at approximately the same rate up to this time; the girls pass the boys during the twelfth and thirteenth years, but are passed by them in the fourteenth and fifteenth years. Height is much more affected by inheritance than is weight.

Malautrition retards growth in height, but to a much less degree than it does weight. Rickets greatly affects growth in height; at three years children with marked rickets are often five or six inches below average height. Much of this difference is usually made up by later growth, but many children remain permanently shorter because of early rickets.

GROWTH OF THE EXTREMITIES AS COMPARED WITH THE TRUNK

At birth the trunk is relatively long and the extremities short. The middle of the body at birth, according to one hundred observations on normal infants made for us by Wilhur Ward at the Sloane Hospital, is three-quarters of an inch (2 cm.) below the center of the umbilicus. The extremities normally grow much more rapidly than the trunk. At birth the measurement from the anterior spine of the ilium to the sale is 43 per cent of the body length; at five years, 54 per cent; at sixteen years, 60 per cent. These facts are of some assistance in the diagnosis of conditions affecting normal growth, such as rickets, cretinism and chandrodystrophy.

THE HEAD

Circumference. The average circumference of the head at birth in four hundred and forty-six full-term infants observed at the Stoane Hospital and New York Infant Asylum was as follows:

The recipitofrontal measurement was the one taken.

The growth of the head is most rapid during the first year, the increase being about four inrices (10 cm.). It is about half an inch a month during the early months, and a fourth of an inch a month during the later months of the first year. During the second year the mercase is about one inch (2.5 cm.). From two to five years (table p. 19) the growth is about one and a half inches (4 cm.) for the three years. After the fifth year, up to puberty, the increase is slow, being at the rate of about one inch in five years.

Closure of the Sutures.—The main sutures of the cranium are not commonly ossified before the end of the sixth month, and very frequently some mobility may be detected at the end of the minth month. Distinct separation of the cranial benes after both is abnormal. It is most frequently seen in premature and in exploitite infants.

Closure of the Fontanels. The posterior fontanel is usually obliterated by the end of the second month. The arterior fontined under normal conditions closes on an average at about the eighteenth month. The usual variations are between the fourteenth and twenty-account months. At the end of the first year the fontanel is generally about one inch in diameter. An open fontanel at the end of the second year may be considered abnormal. The closure of the fontanel is not always early in well-nounshed stablism, nor is it always delayed in those suffering from multiatrition. In very rare cases the anterior fortunel may either be closed at birth or may close during the first few weeks of life. Closure of the fontanel by the middle of the first year is aften seen in cases of arrested cerebral development. This indicates a serious condition, usually reterocepholis. Closure of the fontanel in the early months of the second year may be due to the slow growth of the brain in a child suffering from general malnutrition but otherwise perced.

By far the most frequent cause of delayed closure of the footanel is rickets, in which condition it may be open up to the end of the third year. A large footanel is one of the striking features of cretinism, and in untreated cases is eften seen as late as the eighth year or later. In infancy an open fontanel with a rapid growth of the head should at once suggest hydrocephalus. There is an hereditary condition in which the fontanel remains open even to adult life. Two such cases in father and son were shown us by Marie in Paris. In both there was also lack of union between the two portions of the classicle.

Shape of the Head .- The diformity which results from compression



Pag 1-Perseyvent Osserocarnos or the Sampran Screek. Death at six works.

the first year the head often becomes flattened at the occipat in consequence of the child's lying too much upon the back. This is easily remedied by changing his position. A slight obliquity of the head may result from a habitual position during sursing or sleep. A marked degree of obliquity is sometimes congenital, but usually disappears by the third or fourth year.

The other almormalities in the shape of the head are chiefly due to rickets and hydrocophalus, more rarely to congenital malformations of the brain. They will be considered in the chapter devoted to these topes. Premature oscification of the sutures of the cranium occasionally gives rise to striking deformities of the head. Depending upon the antures involved the head may be long and narrow or it may be short and high. These two types are known respectively as supphocephaly and oxyexpludy. They are referred to more fully in the chapter upon Internal Hydrocephalus. Fig. 3 shows a skull with complete obliteration of the sugittal auture. In this case there was a mide separation of the autures at the junction of the parietal and temporal bones. Premature ossification of the ox tribusilars at the base of the skull is largely responsible for the prograthism and peculiar formation of the cranium seen in chondrodystrophy.

THE CHEST

Measurement of the chest should be taken midway between full inspiration and expiration and at the level of the nipples. The figures for children up to the age of four years given on page 19 are from personal observations. Thereafter, according to the observations of Porter and Boardisch upon over 37,000 children, the average growth of the chest is about one such a year up to lifteen years, when the average measurement is 30 inches in both sexes.

In the newly-bern child the antero-posterior and the transverse diameters of the chest are nearly the same. As age advances, the transverse diameter increases very much more rapidly, so that the outline of the chest gradually assems an elliptical slarpe, which it maintains during childhood.

At borth, the circumference of the chest is about one-half inch less than that of the head, but throughout infancy the two measurements are nearly the same. It is not until the third year that the average circumference of the chest exceeds that of the head. The clast measurement in infants is always much modified by the amount of fat; but, after making due allowance for this, a large chest always indicates a robust child and a small chest a delicate one. If at any age the rireumference of the child's class is found to be below the average, means should be taken, by gymnestics and otherwise, to develop it.

In infants deformation of the thorax result chiefly from rickets, sometimes from empyona, emphysema, and cardiac disease; in older children, from lateral curvature of the spine, or from Pott's disease. A peculiar deformity, usually congenital, but sometimes rachitic, in the funnelshaped chest, the Trickler brand of the Germans. It consists in a deep pitlike central depression at the lower and of the sternum. It is usually permanent.

THE ABDOMEN

Throughout infancy the circumference of the abdomen is, as a rule, about the same as that of the chest. At the end of the second year the measurements of the head, chest, and abdomen are very often identical; after this time the chest measurement increases much more rapidly than the other two. Marked enlargement of the abdomen is seen in many varieties of chronic intestinal disorders. The tympunites that often accommences rickets is a frequent cause of enlargement.

MUSCULAR DEVELOPMENT

The first voluntary movements are usually in the fourth meath, when the infant deliberately attempts to grasp some object placed before him. During the fourth menth, as a rule, the head can be held erect when the trunk is supported. In many infants thus is possible in the early part of the third month. At seven or eight months a healthy child is usually able to set erect and support the trunk for several minutes.

In the ninth or tenth month are usually seen the first attempts to bear the weight upon the feet. At eleven or twelve months a child usually stands with slight assistance. The first attempts at walking are remmenly seen in the twelfth or thirteenth month. The average age at which children walk freely alone has been, in our experience, the four-teenth or fifteenth month. Quite wide variations are seen in healthy children. Very much depends upon the surroundings. We have known infants to walk at ten months and many others not until seventeen or righteen months, although showing no evidences of disease, and although their development had not been retarded by previous illness. A very marked difference is seen in different families with respect to the time of walking.

The physician is often consulted because of backward muscular development, most frequently because the child is late in walking. General malautration, or any other severe or prelonged illness, may postpone for several months this or any of the other functions mentioned. When there is no such explanation of the backwardness, a child who does not hold up his head, sit alone, or make efforts to stand or walk at the proper time, should be submitted to a careful examination for mental deficiency or cerebral or spinal paralysis, but especially for rickets, which is the most frequent explanation of the symptoms.

Contrivances for teaching infants to walk are unnecessary, and their effect may even be injurious. An infant should be allowed the greatest possible freedom in the use of his limbs. He should not be restrained from walking when inclined to do so, nor continually urged to walk when no voluntary attempts are made. Nothing short of mechanical restraint will prevent a leadthy child from walking or standing when he is strong amongh to do so.

DEVELOPMENT OF THE SPECIAL SENSES.

Sight.—The newly-bern infant avoids the light. The pupils contract in a light room, and if a bright light is brought before the eyes they close. Turing the first few weeks the infant indicates by every sign that excessive light is unpleasant. As early as the sixth day the eyes will sometimes follow a light in the room and the child may even turn the bend for this purpose. The muscles of the eyes of the newly-born infant act irregularly and not in harmony. Collectinate action for general purposes is not established until about the end of the third month. Even after this time incoordinate action is occasionally seen. The cyclids also more irregularly, and are often purily separated during sleep. The cornea is but slightly sensitive during the first weeks. In Proper's child it was not until the third month that the lish closed when the water in the bath tenched the lashes or the cornea. The reasonition of objects seen is usually epident in the sixth month.

It is important that the room in which the newly-born child is placed abould be darkened, and that for the first few weeks the eyes should be protected against strong light.

Hearing.—For the first twenty-four hours after birth infants are deaf. This deafness sometimes persists for several days. It is believed to be due to absence of air from the middle car and to swelling of the miscone membrane which lines the tympanum. With the movements of respiration, air gradually finds its way into the middle car, and the swelling subsides during the first few days. After this the hearing gradually improves, and during the early menths of life it is very acute. The child starts at the slamming of a discr, and even moderately load misses will waken him from sleep. By the end of the second month he will sometimes turn his head in the direction from which the sound comes, and by the end of the third month this will usually be done. Denine found, in observations upon one hundred and fifty infants, that wices were recognized on an average at three and a half months.

Not only are the curs unusually sensitive to sound in infancy, but the impression produced upon the brain is often marked—very land sounds causing great fright.

Touch .- Tactile sensibility is present at both, but is not highly developed except in the lips and begges, where it is very scale for the obvi-

SPEECH 2

one necessity of sucking. After the third month it is fairly acute over the surface of the body generally. Two especially sensitive areas, according to Preyer, are the forehead and external auditory mentus.

Sensibility to painful impressions in present in early infancy, but

very dull as compared with later childhood.

Temperature is also distinguished. This recognition is especially acute in the tongue. A young infant is often seen to refuse to take the hottle because the milk is only a few degrees too cold or too warm.

The Isealization of sensory impressions comes later, probably not much before the middle of the sixth month, and is very imperfect

throughout the first year.

Taste.—This is highly developed, even from borth. According to the experiments of Kusamard, the ability to distinguish seven, sear and bitter, exists in the newly-born child—aweet exesting surking movements, and hitter, grimaces. A young infant detects with surprising accuracy the slightest variation in the taste of his feed, and the smallest difference is aften enough to cause him to refuse the bottle altogether. Sweet substances are always easily administered, and in combination with syrups even very bitter substances can be given; but to aromatic purchers and clivins be usually objects.

Smell.—Observations upon the sense of smell in newly-born infants are few and not altogether conclusive. Kenner's experiments appear to show that smell is present in the newly born. It has been noted to be especially assuse in infants born blind. The sense of smell is developed nuch later than the other senses. Detection of fine differences in odors is not acquired until quite late in childhood.

SPEECH

There is a very wide variation in shiften with reference to the time of development of the function of speech. Girls, as a rule, talk from two to hear months earlier than loys. Towards the end of the first year the average child begins with the words "pape," "manma." By the end of the second year he is able to put words together in short sentences of two or three words. Progress in speech from this time is very rapid, each month showing great improvement. Names of persons are semmanly first acquired, then the names of objects. Next to this the verbs are formed, and then adverbs and adjectives. Conjunctions, propositions, and articles follow in order, and last of all the personal pronouns.

If a shild of two years makes no attempt to speak, some mental defect, may usually be inferred or that the child so a deaf mate.

DESTITION

The teeth are enclosed at both in dental sacs which are situated in the gums. Superficially they are covered by the subaucous connective tissue and the mucous membrane; the dental sacs rost in depressions in the alveolar process of the jaw. The tooth grows in length mainly as the result of the calculication of its roots, and being thus fixed below, it pustes upward towards the mucous membrane. This growth undoubtedly goes on steadily from both until the tooth pierces the gum.

The decidness or milk teeth are twenty in number. The time at which they appear is subject to considerable variation even under normal conditions. The following is the order and the average time of appearance of the different teeth:

(1)	Two	Lynn	er cen	trat is	sciences						ar.	6ti	0.9	months.
				was.										
(3)	Two	Som	er lat	eral is	electe	and	four	sate	ier.	sank	-	12 "	15	-
340	Fou	1049	ises.	0.000	0000		0000			000	KH.	18 "	21	
(5)	For	(pos	terior	racks	19				2000		18	24 =	30	
At	1 59	A.36	shed	shooth	d hite	Sections				0.00	111	1111	6	teethi
At	156.3	eats.	4	-	-	*****		00000	1000	0000			12	
At	•	0	5	199	7.1	11115	01111	0.050	*111	000	0.11	1100	16	
At	234	4	88.		M								20	

Quite wide variations on both sides of the average are common, and are not always easy of explanation. In many cases it seems to be a family sdiceynerasy, since in the different members of a family the teeth are apt to appear at about the same time. The order in which the teeth appear is much more regular than the time of their appearance. Slight variations are exceedingly common, but marked irregularities in the order of the appearance of the teeth are the rule in idiotic children or those suffering from elighter mental defects.

The teeth may pierce the gum without any local manifestations. Very frequently, however, just before a tooth comes through there is noticed a moderate swelling and reduces of the muccus membrane of the gum overlying it, and to a slight degree this may affect the general mucus membrane of the mouth. This condition may be accompanied by a little fretfulness and increased salivation, or both of these may be entirely wanting. These symptoms usually disappear when the tooth has pierced the gum. The symptoms of difficult dentition will be discussed in connection with Discusses of the Mouth.

Infants may be born with teeth. We know of one family in which this occurred in three members of three successive generations. It is, however, rare. It is almost invariably one of the lower central invitors that is present. In case this interferes with nursing, or if it is very loosely attached to the gum, it should be extracted, but under other circumstances it should be allowed to remain, since, if it is removed, a second tooth is not likely to appear in its place in the first set. It is not at all uncommon for the first teeth to appear in the fourth month. Such teeth, in our experience, do not neurally differ in character from those appearing later, unless they are in children who are syphilitic. Suphilitic children are rather prope to early deutition, and under such carcumstances rapid and early decay is likely to take place. Nursing infants are, as a rule, a little earlier in their deutition than those artificially fed.

Delayed dentition is usually due to rickets. However, in many bealthy infants no teeth appear before the tenth month; and we have occasionally seen the first ones at thirteen months in those who seemed perfectly healthy and showed no other stidence of rickets. On the other hand, it is by no means invariable that dentition is late in rachitic children. The latest dentition is seen in cases of cretinism. In such children it is not rare for the first feeth to appear as late as eighteen months or two years. As a rule, dentition and ossification of the bones of the head go on in a corresponding manner; where one is early the other is likely to be rapid, and conversely. Great irregularities in dentition are common in children with defective cerebral development.

Provided an infant is well nourished and thrives properly for the first six or eight months, the eruption of the teeth is likely to go on steadily after this time, even though the rhild may later have chronic indigestion or suffer from extreme malnutrition from any cause except rickets. If, however, the symptoms of malnutrition date from birth, dentition is almost invariably delayed. It is often a matter of very great surprise to see stabling who are markedly emuciated as a result of chronic indigestion or ilevealities and yet go on cutting their teeth regularly. We once had under our care a delicate infant of sixteen months, whose body length was twenty-eight inches and whose weight was less than mineteen pseuds—almost exactly what they were eight months previously—and yet he had thirteen teeth.

Eruption of the Permanent Teeth, ... The first to appear are the first malars, which usually come in the sixth year, and hence the name six year old malars, which is applied to them. These appear posterior to the second malars of the first set.

The incisers and canines replace the corresponding teeth of the first set. The eight hierapids take the place of the eight melans of the first set. The melans of the permanent set appear back of the hierapids, room being made for them by the growth of the jaw. As they grow and push invitant the permanent teeth cause atrophy of the roots of the first teeth, and gradually cut off their blood supply, so that they loosen and fall out, The following table from Forchbeimer gives the average time of the

appearance of the second teeth;

First molars		6 years.
Income	7 to	
Bicupels	-	10 "
Cornes	32 -	14 "
Second molars	12 =	15 "
Third molars	37.4	25 "

The place of dentition as an etiological factor in the diseases of infancy will be considered in the shapter on Difficult Dentition.

CHAPTER III

PECULIARITIES OF DISEASE IN CHILDREN

In many particulars disease in children differs from that of later life. These differences relate to etiology, pathology, symptomatology, diagnosis, and prognosis. The greatest contrast to adult life is presented by infamy and early childhood. After seven years, children in their diseases resemble adults more than they do infants.

ETROLOGY.

1. Inheritance is an important factor. The discuse most frequently transmitted directly is syphilis. Occasionally tuberculosis and other infectious discuses have been conveyed directly from the mother to the child. In cases where no distinct disease is transmitted, children may inherit from parents constitutional weaknesses or tendencies, which may manifest themselves in infancy, or in some cases not until later child-bood. Under this head we may place the influence of alcoholism, lead poissoning, rheamatism, good, epilepsy, and insunity.

Malformations must be considered, particularly in the first two
years of life. The most important of these, from a medical standpoint,
are those of the heart, brain, stomach and intestines, and kidney. The
various multirenations of the mostle, ness, bladder, rectum, and genital

organs belong more porticularly to the domain of surgery.

3. The Diseases or Accidents Connected with Birth.—Some of these are distinctly transmatic, like the meningral bemorrhages. A very large class are the infectious processes in the newly born. Infection usually

takes place through the umbilical wound, more rarely through the skin or mucous membranes. This class includes pyemia, with its varied lesions in the brain, bings, and serious membranes, crysopelas, ophthalmia, and tetanas. In the class of infectious diseases may also be included many of the varieties of palmonary and intestinal diseases in the newly born, and probably also some of the homotrhagic affections.

- 4. Conditions Interfering with Proper Growth and Development.— These are among the largest etiological factors in the diseases of infancy. They are improper fixed or feeding, unhygienic surroundings, and neglect. These may cause specific diseases, like rickets or scarry, or may lead to a condition of general malnutrition or marastrus. In this way they become most important predisposing factors, in infancy, to the acute diseases of the gastro-enteric tract, and later in childhood, to functional nervous diseases.
- 5. Infection.—This has already been mentioned as an important factor in diseases of the newly born. The number of diseases in later life directly traccable to this is very large. Under this head should be included not only the well-known classes of infectious and contagious diseases, but also a very large number of varieties of infection which as yet have not been differentiated, and the nature of which is but imperfectly understood.

SYMPTOMATOLOGY AND DIAGNOSIS

In older children the symptoms of disease are very much the same as in adults, and similar methods of examination may be employed. What is really peculiar to children belongs especially to the first three years of life, before speech has developed. During this period the chief and almost the sole reliance of the physician must be upon the objective signs of the disease. It is not so much that diseases in early life are peculiar, as that the patients themselves are peculiar.

Two fundamental facts are always to be kept in mind: First, that the common pathological processes are comparatively few, being chiefly of the gastro-enteric tract, the lungs, and the brain, but that the variations in clinical types are almost endless; the second is, that in infants, on account of the susceptibility of the nervous system, functional derangements are often accompanied by very grave symptoms, and may even prove fatal in twelve or twenty-four hours, or there may be speedy and complete recovery after very alarming symptoms. In many of these cases the symptoms are so indefinite that an exact diagnosis is impossible during life, and even the autopsy may throw but little light upon them. At the bedside it is of great assistance to the physician if he can keep in mind the most frequent forms of acute discuse that are likely to be met with. In the first group, including those which are very common, may be placed acute sudigestion and deceditis, bronchitis, praumenia, pharyugitis, toosellitis, and offits media; in the accord group, which are less frequent, are placed the more common acute infectious discuses; in the third group, including the carer forms of acute discuse—meningitis, tuberculosis, rheumatism, and discuses of the kidneys. In all circumstances, the season, and the nature of the prevailing epidemic, if one exists, are to be considered.

In the examination of a sick infant quite a different method is to be followed from that pursued with adults. Much information is to be gained from a history carefully taken from an intelligent mother or nurse, and much more from a close observation of the child, whether solvep or awake, quiet or crying.

The History.—In view of the fact that but little information can be had from the patient, none at all in most cases, it is important to obtain from the mother or nurse as full and complete information as possible. A good history carefully obtained, puts the physician in possession of a fund of information about the patient which is not only of the greatest value in arriving at a diagnosto in the illness for which he is consulted, but is exceedingly helpful in the future management of the child. He may thus know the individual peculiarities and special pathological tendencies. The faity attach great importance, and justly so, to advice from the physician who "knows the child's constitution." Such a history should be taken at the first opportunity after the physcian is placed in charge of a child, and with note-book in hand, or half six value will be last.

Family History.—This should begin with the parents, going farther back, if possible, in many cases of hereditary disease. One must know regarding tuberculous, syphilis, rheumatism, or alcoholism, the general vigor of constitution and physical condition of both father and mother. Health during pregnancy, and previous miscarriages, if any, are important facts in the mother's history. One should know the number of other children living and their general health, the number dead and from what causes. A knowledge of the surroundings in which the child has lived may be necessary to appreciate the chances of exposure to inherculosis, malaria, and many other forms of infection.

Polices's Previous History.—This should begin with hirth. One should inquire whether the child was premature or born at term, regarding the character of the labor, whether natural or instrumental, tellious or complicated, the condition and vigor of the child at birth, primary respirations, early convolutions, and the notrition during the early days. Next the methods of feeling should be taken up-how long entirely. and how long partly breast fed, the date of wearing and the form of artificial feeding then employed. If the patient is an infant, and the problem presented is one of its nutrition, all the reliable data relating to the feeding should be obtained, even to the minutest detail. This may be wearisome and consume time, but in no other way can one appreciate the conditions present. The best idea of the shild's growth and development may be obtained from a weight record if one has been kept. If not grailable, one must depend upon general statements as to how the child thrived at different periods. The date of the appearance of the first teeth and the time and the order in which the teeth came, are significant. The general muscular development may be best determined by learning when the child could first hold the head erect, sit alone upon the floor, bear the weight upon the feet, eresp or walk alone; the mental development, by learning as to early recognition of mother or nurse, knowing the lottle, understanding the meaning of words, speaking in words or sentences. The museular and mental derelopment of a normal child during the first two years is a subject with which the physician should be familiar if he would detect early those differences, often slight at this age, in children whose development is backward owing to cerebral lesions.

All previous attacks of acute illness of whotever character should be noted, particularly the infections diseases-measles, scarlet fever, diphtheria, pertussis, and influente-with dates and details as to duration, severity, and complications. One should learn whether the child is especoally press to disorders of digestion or those of the respiratory system. Under the former head are included early difficulties in feeding, acute attacks of indigestion, diarrhes, or desenters, also chronic disturbances of the stemsch or bowels; under the latter head, frequent catarrial tolds, sarache or otitis, catarrhal group, broachitis, proumonia, or plenrisy. Other points to be investigated relate to attacks of tonsilities, operations for the removal of hypertrophical tonoils or adenoids, and previous disorders of the nervous system. In infants, particularly important are extreme restlessness, insomnia, convolsions, or attacks of night terrors; in those who are older, hysterical manifestations, epilepsy, or choren. Finally, one should know the date of successful vaccination. Inquiry should also be made concerning any recent exposure to infection in the community, school, or home.

Present Illnexx.—One should first note the chief complaints as stated by mother or nurse. It is important to obtain as definite statements as possible as to the time when the child was quite well, and whether the enset of the illness was abrupt or gradual, and with what particular symptoms. In all digestive disorders one should know exactly concerning the child's food at the time of the onset, its quantity, character, and preparation; also any recent change in diet, the presence or absence of veniting, and the condition of the hawels, whether losse or constiputed, the frequency and character of the shock. General questions as to whether the lowels are regular or the shock normal are of no value, since the informant often is not capable of judging correctly.

Nercons symptoms, like the others, should be elicited in response to direct questions regarding sleep, restlessness, meaning, crying out, or other evidences of pain, excitement, deliman, or convulsions, or unnatural drowsiness. In any scute illness other important symptoms are fever, recating, dysposes, cough, hourseness, assail discharge, and the amount and character of the urine.

The Examination.—With infants, quite a different method should be followed from that pursued with adults. It may well begin with:

General Inspection.—What is learned in this way will depend almost entirely upon the scuteness of observation of the physician, but much that is of value can be ascertained before the clothing is removed for the physical examination by simply watching the patient, whether askep or awake, for several minutes. In scute disease, the following points should be noted seperially:

 Nutrition and general development; whether the child is well nourished or the features pinched and wasted.

The facial expression: whether it is bright and intelligent or dull and stupid, peaceful or anxious, quiet or disturbed, and whether the features are contracted from time to time, as if from pain.

- 3. The character of the respiration; whether it is rapid or slow, easy or difficult; whether there is most obstruction, as indicated by moring and month-breathing, suggesting in infants acute rhinitis, syphilis, or retropharyngest abscess; in older children, diphtheria, searlet fever, or sciencids. Marked dyspoen is usually accompanied by active dilutation of the also nasi.
- The posture: whether the shild lies upon the back, side, or face; whether the head is drawn back with general flexion of the extremities as in meningitis.
- The nervous condition: whether the child is restless, excitable, or drower and apathetic; if solvep, the nature of the sleep should be observed.
- The color of the skin of the face; whether pale or cyanotic; and the lips, whether fissured or excoriated.
- The amount of prostration: a practiced eye can usually tell with older children whether the condition is grave or not, but infants not infrequently deceive even the most experienced observer.
 - 8. The cry: in conditions of restlessness or irritability, much infor-

mation may be obtained from its character. It is important, but not always say, to determine whether a child cries from fright, as at the approach of a stranger, from nervousness or had training, from general irritability which may come from any acute disease, or from actual pain. The cry of fright is usually evident, because it comes with the physician's approach and reases when he goes away. Children of highly neurotic parents and those who have been much indulged and hadly trained will often cry when anything out of the usual routine occurs. The cry of pain may be very distinctive; it may be sharp and acute and accompanied by some attempt at localization, as when a child puts has hard to an inflamed part, but in infancy the pain of acute inflammation is often indicated only by general restlessness and irritability. This is frequently true of acute otitis. The cry of pain is usually accompanied by contraction of the features and other evidences of distress.

The cry of some diseases is quite characteristic, as the short, catchy cry of neute pneumonia or bronchitis; the hourse cry of laryngitis, whether saturated, membranous, or syphilitic; the feeble whine of extreme exhaustion or marasmus; the meaning cry of intestinal disease; and the sharp cry of a child with scarvy whenever its bed or body is touched.

Measurements:—These, though of greatest value in chronic diseases, particularly disturbances of natrition, may be of assistance also in acute conditions. The important measurements are the circumference of the bead, chest, and body length. The circumference of the abdomen is at times important, but varies so much with the degree of distention that it is not significant as to the general development. The measurements and weight furnish reliable data which are not only of assistance in the diagnosis of existing disease, but if recorded are useful for future comparison.

In taking the circumference of the head the largest measurement (over the occipital and frontal eminences) is preferable. The measurement of the chest is usually taken over the nipples. The body length of infants is best taken with a tape as the child lies upon his back upon a table or a firm bed. For older children a special measuring stick is convenient.

To estimate properly the significance of measurements they should be compared with the normal averages and with each other. It should be remembered that the head is normally larger than the clost until near the end of the second year; after this time, with a normal development, the chest should be larger. Any great disproportion between the size of the head and clost is suggestive of disease. The large head and the small chest belong especially to rickets. The measurements form important means of recognizing early such abnormalities as cretinism and chondrodystrophy, the sariations often being marked before the other comptons are prominent. One who forms the liabit of taking regular measurements soon appreciates the variations from the nermal, and gains great assistance from these data. Such a record mode from year to year in children whose development is in any way absertial is of great value in indicating what should be done in the way of exercise to correct faulty conditions.

Vital Signs.—Pulse, Respiration, and Temperature.—The significance of these signs is not to be measured by adult standards, since the smooptible nervous system of infants and very young children greatly

exaggirates their reaction to all forms of armie infection.

The rate, regularity, quality, and tension of the pulse should be noted. In young children, the rate of the pulse is of less importance than its force and quality. A slow, irregular pulse is always significant, and should suggest meningitis or brain tunser; a slight irregularity of the pulse during sleep has no special significance. The pulse rate is much increased from slight disturbances; the approach of a stranger or the examination by the physician may cause it to rise 20 or 30 beats. In acute disease, a pulse rate of 150 is common, and 170 or 180 is often seen where other symptoms are not particularly seven.

The rate, depth, and rhythm of respiration should be noted. The last often cannot be determined except by attentively watching the child for several minutes. In premature and very poung infants a rather marked irregularity may be seen, often approaching the Chepne-Stokes type. It is not to be taken as indicating a cerebral lesion, but seems rather to be due to the fact that the respiratory center is not yet fully able to control the movements. Respiration of this type is seen only during the first weeks of life. Irregularity of shythm at other times should suggest cerebral disease, usually meningitis. The respiration rate is proportionately greater in infants than in adults. In scute diseases of the lungs it not infrequently rises to 70 or 80, and occasionally it may be over 100 a minute. The rate is generally in proportion to the extent of the pulmonary lesson.

The temperature of infants and very young children should be taken in the rectum, since groun or usillary temperatures are untrustworthy and those in the mouth difficult to obtain. I tempelantely after birth the temperature of the child is about the same as that of the mother, or a little higher. It falls from 1° to 5° F, in the course of the first few hours. Soon it again rises to 98.5° or 50° F.

From a large number of personal observations upon healthy infants, we have found that the rectal temperature under normal conditions varies between 98° and 90.5° F.; occasionally the range may be as wide as 17.5° to 190.5° F. in apparently perfect health. The heat-regulating center in the brain acts only insperfectly in the young infant, and slight causes are enough to disturb the temperature.

The temperature in infants is always higher than from corresponding causes in adults. Moreover, very high temperatures may be met with in cases not serious, and not infrequently when no explanation can be found even after thorough examination. In such cases the temperature seldom remains at a high point for more than a few hours. It is a continuous high temperature rather than a single rise which is significant of disease in infancy. Nothing is more perplexing to the young practitioner than the frequency with which a high temperature is seen in infants in cases of comparatively mild illness.

It is common in chronic wasting diseases, in delicate infants and in those prematurely born, to find the temperature one or two degrees below the normal; 95° and 96° F, are of almost daily occurrence in hospitals, and much lower ones are not rare. Daily observations should be made with the thermometer in such conditions, just as in fever.

Puzzling and apparently alarming temperatures are seen in infants as a result of the application of artificial leat. In one of our patients, an infant two days old, a temperature of 107° F, was caused by the close proximity of two large hot-water bags placed in the baby's basket. The pumper and feebler the child the more readily are such temperatures produced.

Muscaler and Mental Development.—The general muscular development is determined by seeing how well the children can hold up the head, sit alone, stand, or walk; the mental development in young infants, by the intelligence of expression, the manner in which they respond to stimuli, the recognition of objects, fright at strangers, etc.; later in the first year, by the use of their bands, their understanding of speech, and their ability to pronounce words.

Local Economics ion.—For the purpose of making a complete rentine examination of an infant the entire clothing, with the exception of the rapkin, should be removed, and the infant placed preferably upon the varse's lap upon a blanket. With older abilities the clothing may be removed and the body examined, one part at a time, but with all children it is essential that the examination be complete. A warm room is indispensable, and a table covered with a blanket in many respects better than the nurse's lap, although the latter has usually to be employed. The local examination should be deliberate, the physician should proceed cautionally, winning the child by gradual approaches, and avoiding excitement, force, or anything which may cause pain.

Skin.—The skin should first be inspected for eruptions, and it is important that the entire eruption be examined in order that the distribation as well as the character of the lesion may be seen. Marked wrinking or less of elasticity of the skin is one of the test indications of loss to weight. Bedoore are more frequently seen over the occiput than over the uscrum. Any large twins should be noted.

External glands should now be examined, especially the terrical, scaling, inguinal, and epitrochlear. The came of a marked enlargement of any of these groups duald be rought in the skin or innoun membranes with which they are connected. Marked swelling of the cervical glands may indicate diphthoria, scarled fever, or a simple scale inflammation dependent upon a charopharyagitis. Enlargement of the spitrochlear glands is especially significant of sphills. General enlargement of all the glands to a slight degree is seen in most case of malnutrition and in many acute infectious diseases.

Head.—One should first note whether the sutures are oscilled, unnaturally open or separated; also whether the fontanel is closed, or, if open, whether it is depressed or bulging. Promineness of the frontal or purietal regions when symmetrical are indicative of rickets. Irregular prominences of a smaller size, when present, are usually syphilitis. In the newly born, a tumor on the head, if in the median line, may indicate an encephalocyle; if limited to either the parietal or occipital bone it is usually a cephalocyna.

Eyes.—The condition of the conjunctivae and bids should be noted, also the presence of ptosis, stratesmus, or other paralysis, but particularly the condition of the pupils, whether contracted or dilated, and the nature of their response to light. One should look also for the presents of corneal ulcors or of interstitial keratitis frequently seen in late hereditary syphilis.

Ears.—The presence of a discharge may be recognized by sight or by the odor. In any acute febrile condition one should look for tenderness or swelling over the ear or masteid. The ears should invariably be examined of sucopecally in all forms of febrile disturbance whose cause is doubtful and from time to time in passimonia, searlet fever, meads, diphthesia and other discusses involving the month and phinepharyan

Nace.—The presence of any usual discharge should be noted and to character determined. As abundant discharge tinged with blood, is young infants, should suggest symbilis; in alder chaldren, diphtheria; a chronic discharge, adenoid growths; a purulent discharge of one side a foreign body.

Mosth.—The appearance of the mosons membrane of the most and gams as well as the teeth may often be ascertained by watching the child while be as crying. If should be noted whether the longue is dry or most, clean or coated, whether thrush is present or any other form of stematicia. If the gams are congested, swollen, or homorrhagis, they should suggest sourcy. The number, position, and character of the teeth are important. The general color of the nuccous membrane may be significant in cases of cyanosis in congenital cardiac disease, and extreme pallor of the nuccus membrane in assenta. On the nuccous membrane of the hard galate may often be found the first local evidence of smallet fever in the form of a minute punctate eruption, and on that portion of the checks opposite the motar teeth should be sought Kopink's sign, the earliest reliable symptom of measles.

Throat.—A careful examination of the pharyns and tonuls should never be emitted in any acute illness, no matter what other symptoms may be present. Not only tonsillitis, but often diphtheria, is overlooked from a failure to observe this as an invariable rule. A good light is essential, and one must train himself to take in all the appearances at a single glance. Marked general reduces of the pharyna may be associated with scarlet fever, influenza, or simple acute pharyngitis. If other symptoms are present pointing to chronic must obstruction or to a extarrhal process of the rhinopharyna, a digital examination should be made to determine the presence of alepatds. Dyspica with mouth-breathing when associated with difficulty in swallowing should, in an usual, always suggest retropharyngeal abscess. The examination of the mouth and threat may wisely be made the last step, since it usually disturbs a child so as to embarrans further investigation.

Neck.—One should consider the position in which the head is held and the amount of rigidity of the cervical nuncles. Opisthetones may be associated with meningitis or old cerebral palsy. A marked rigidity may indicate cervical Pott's disease or, if accompanied by torticollis, may be of rheumatic sergin.

Chest.—In young children particular importance should be attached to the shape of the chest. Symmetrical deformities are usually due to rickets. Contraction of one side only is most frequently the result of an old empyema or an extensive interestitial passumonia. Bulging of the preparatial region is frequent in surdiac disease. One should notice also the recession of the act parts—intercestal spaces, the suprasternal notch, or the epigastrium; the amount of this is usually the best means of judging the severity of obstructive desputes. Details regarding the physical examination of the lungs are discussed in the introductory chapter to Pulmonary Diseases.

Heart.—It should be remembered that under two years old loud murmurs are almost invariably of congenital origin, that soft nurmurs at the base are very frequently functional, and that acquired cardiac disease is rare until after three years. For further details in the examination the reader is referred to the chapters upon Diseases of the Heart.

Abdonou.-There should be noted the presence or absence of tym-

punites or abdominal tenderness, whether general or localized, and the existence of retraction of the abdominal walls as in meningitis. The size and position of the liver and spleen are best determined by pulpation. The lover border of the liver is usually slightly below the free border of the ribs. If the spleen can be easily felt below the ribs, it is, as a rule, cularged. If it can not be felt in a satisfactory examination, it is not sufficiently enlarged to be of any disgnestic importance. In scute disease a large spleen suggests mularia, typhood, or tuberculosis; in chronic disease, rickets, mularia, syphilis, lenkemia, or anomia.

Spine.—The most frequent spinal curves seen in infancy are those due to muscular weakness. These disappear by placing the child in a prone position. Rachotic curvatures are of the same general character, but as they have usually lasted a longer time the spine is less flexible and the curvatures may not entirely disappear by change of posture. An angular deformity or even marked rapidity of the spine should suggest. Pott's disease.

Extremities.-The color of the skin and the character of the peripheral circulation should be noted especially in pneumonia, diphtheria, and other discoses attended by weakened heart. Christing of the fingers or toes may be flue to congenital heart disease or to chronic disease of the lungs. Desquimation of the palms or soles may indicate hereditary syphilis or scarlet fever, even though no other evidence may be present. The flager-nails may give valuable information in heroditary sophilis. In examining the extremities one should note especially the presence of tenderness, flaceldity, or rigidity of muscles, whether the limbs are wasted or plump, and the degree of muscular power; also any abnormal swelling on the shaft or near the extremities of the bones, and, finally, the function of the joints. A general relaxation of the ligaments is common in rickets, in paralytic conditions, and in the Mongolian type of mental deficiency. Flahleness of the unucles belongs to malnutrition and reckets; rigidity, if chronic, is usually indicative of cerebral pulsy. Weakness of special groups, with atrophy and faccid muscles, suggests poliomyelitie. Acute tenderness of the legs in infants should suggest scurvy; in older children, ostsomyelitis or rheuma-Bachitic deformities are almost invariably bilateral. Tuberculous bene disease affects the opophyses, while apphilis usually involves the shafts, the only exception to this being the epiphyseal separation which may occur in the first mentles of life,

The reflexes may be somewhat difficult to obtain in infants and when exaggerated may indicate cerebral pulsy, meningitis, or, as in betany, only an extreme irritability of the nervous centers without organic discour-The plantar reflex of Babinski has little significance in infants, and in older children it is present in many conditions. Kernig's sign is a form of muscular spasm almost invariably present in meningitis, but often seen in other diseases.

Genital Organs.—Male children should be examined to determine the presence of phimosis or of undescended testicles. Hydrocele of the cord is a frequent condition, and may be mistaken for homin. Both inguinal and umbilical hernine are very common. In female children it should be remembered that preputal adhesons may be considered normal, and are selden the cause of the nervous symptoms attributed to them. Every vaginal discharge is significant, and if puralent should be examined bacteriologically. The great frequency of genecoccus infections is not appreciated, and they may be found when least expected.

The examination is not complete without the inspection of the alsols, the chemical and microscopical examination of the arise, and an examination of the blood. All are more fully considered in special chapters.

PATHOLOGY

The pathological processes which result from intra-uterine disease and those which are connected with delivery are peculiar to early life. They have already been referred to in the section on civology. Of the processes of early life which begin after birth, the first in frequency are those of the nucous membranes resulting from the various forms of irritation and infection. In summer, it is the stomach and intestines which suffer chiefly; in winter, the respiratory tract.

The serous membranes are rarely the seat of primary inflammation. The picura is seldem the seat of primary disease, but is very often involved secondarily to disease of the lung itself. Affections of the pericardium and peritoneum are quite rare. Meningitis is fairly common, especially the tulerculous form.

Diseases of the lymph nodes (lymphatic glands) play an important part in connection with the acute diseases of the murous membranes, with many affections of the skin, and even of the viscera. Acute infection tends to excite suppurative inflammation, particularly in infants; a less active process lends to chronic hyperplasis in the mesenteric, mediastical, and cervical glands, in the tensils, adenoid tissue of the pharynx, etc. The lymph nodes in the neck and thorax are frequently the earliest seat of tuberculous deposits, and in very many cases they are the foce from which secondary infection of the lungs, brain, or joints may occur-

Of the visceral inflammations those of the lungs are the most common, it being care to find the lungs normal at autopsy after any acute infections disease which has lasted a week. Up to the third or fourth rear of life the heart usually escapes. In older children it may be intelved, as in adults, in the rhyumatic diseases. The liver and spless are not often the sent of organic disease in early life, nor is actions disease
of the kidney likely to be met with except in connection with scarlet
force. Organic disease of the brain itself is rure, as is also organic
disease of the spinal cord, with the exception of poliomyclitis. Chronic
diseases of the different viscora are decidedly rare, except when resulting
from acute processes. Diseases of the bones and joints are connect, and
of extreme importance. They are usually of tuberculous, less frequently

The following table gives in a general way a very good idea of the relative frequency of discusses of the different organs in inferity. It is based upon seven handred and twenty-six consecutive autopoior in the New York Infant Asolum, extending over a period of eight years during our connection with that institution Of those children seventy-two per cent were under one war, twenty-five per cent between one and two years, and only three per cent were over two years. The institution did not receive infants under one month, hence the absence of lexions peculiar to the newly-born:

Table showing principal believes in trees handeed and twenty-siz pensociative outopoles in the New York Infant Arguns.

Lungs:		
Paeuminia	-Prissay	
	Complicating other scate infectious diseases 112	
	Complirating other conditions	
	Nated to be present in	
Picarioy-	No case encomplicated with disease of lungs,	
	Empoyma A	
	Seems pleariey 1	
	Dry pleaney in nearly all the severe cases of preu-	
	Dolla.	
Asilestaeie	(Congrattal)	
Palmonary	above (always with preparatio)	
Printenacy	gatgrene (always with paramonia)	
Printerry	tuberculosis	
Mouth:		
Norm		
Peritoneum!		
Acute perit	onitie (Ioralized 2, with neutre preezmoura and pleurisy	
2)	***************************************	
Kidneyer		
Acute pople	ritie (complicating exacts fover 4, diphtheria 1, page-	
monta	4. meades 1. pertame 1. descriptio 2. pyoneghrosis 1.	
apparet	orby primary 5)	
Malformati	one of the kidney	
Stoners and Inc.	utined;	
Acute ileac	olitis, with or without gustratus	
Acute gastr	itis (without intestend lerions)	
Aruse diarr	heal disease (without gross festers)	
Introotseyy	Don 1	
	The state of the s	

of syphilitic, origin. Discusses of the blood are quite common, but us jet but little understood. New growths are rare. The parts most frequently affected are the kidneys and the bones. Disorders of nutrition are extremely common and of great importance, particularly rickets and scurry.

PROGNOSIS AND INFANT MORTALITY

The yearner the patient the worse the prognosis in all the diseases of childhood. This is in consequence of the feeble resistance of the infantile organism to all diseases, particularly those which are of an acute nature. On the other hand the great changes which in early life take place in the different organs and tissues as a result of growth make recovery possible from many serious organic conditions. The extent to which the consequences of disease may be "outgrown" is often remarkable, provided the nutrition of the body can be maintained at its best.

The accompanying chart (Plate I) shows the mortality of New York City by months during three consecutive years, representing a total mortality of 128,136.

The following table gives comparative figures of actual deaths for four periods of three years each, and shows the reduction in infant and child mortality which has taken place in the last twenty-five years;

Deaths-New York City (Borought of Manhatton and Bronz)

-	1999-1992	1404-1500	1907-1900.	1903-1964
Under 1 year 1 to 2 years 2 * 5 * 5 + 15 * Over 15 *	32,916 = 36% 19,547 = 8% 9,794 = 7% 5,470 = 54% 69,400 = 54%	29,335 = 24°5 9,012 = 7°5 7,292 = 6°5 6,922 = 3°5 71,024 = 58°5 123,576	30,626 = 22,575 8,298 = 6,075 6,679 = 5,075 4,902 = 3,575 85,741 = 60,075 106,146	23,015 = 19,115 4,027 = 5,05 5,408 = 4,15 4,533 = 3,55 9,341 = 68,3%

biographic and the second seco
Perimeditis (all with scate pneumonts)
Congenital multiennations
Acute or chronic endocarditie
Bruie:
Anna contract was an effective and a contract to
Acute meningitis (7 with plications, 2 cerebropinal)
Tuberculous numingitie
Acute encephalitis
Chronic packy meningitis
Contract Jacobine and Dec. 1101111111111111111111111111111111111
Chronic meningtis
Chronic hydrorephalus

Afrens by

These were received deaths from manages well-out grow beions.

The deaths per 1,000 of population above the same reduction. The enryes for the different age periods are indicated in the accompanying chart (Fig. 4).

The reduction in infant mortality in New York has been chiefly in acute gastro-intestinal diseases, marasmus and debility, especially in those over three months old. In older children it has been chiefly in acute infectious diseases, especially diphtheria. The mortality from

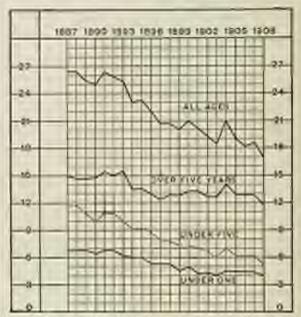
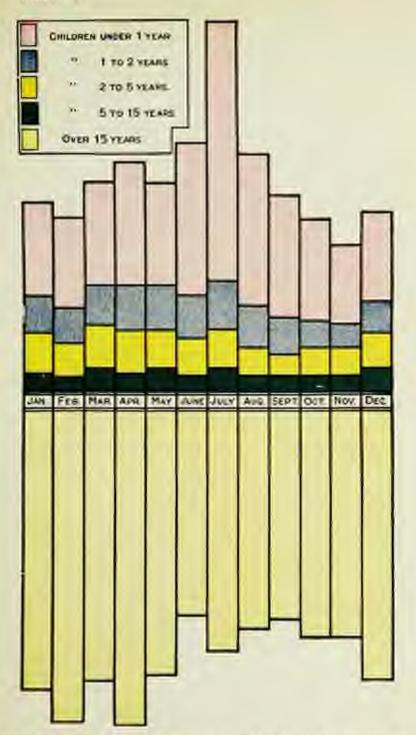


Fig. 4.—Dearms—New York Circ - res 1,000 or Porchamost.

certain other causes is increasing, notably acute respiratory diseases and prematurity.

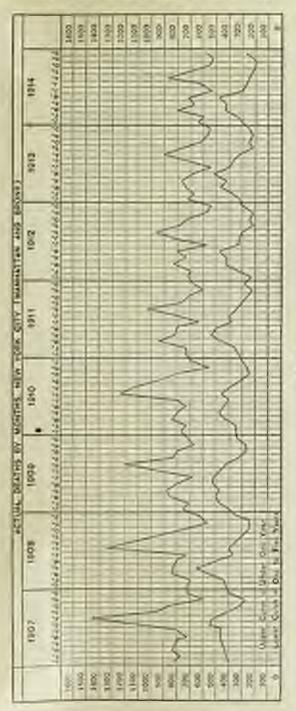
The only age in which the mortality is increased during the summer months is the first year. In Fig. 5 are given the curves indicating the deaths under one year and from one to five years by months,

The rise in the summer mortality during the first year is chiefly due to distribuil discusses. As a result of the organized compaign for the reduction of infant mertality in New York which has been in full operation since 1911, the number of infant deaths has steadily fullen. That part of the mortality curve chiefly affected has been the sharp summer rise which has been almost obliterated. It will be noted that the curve for children from one to five years of ugo touches the highest point in the late winter and early opting mouths, the time when peraments and the common contagions diseases are most prevalent.



Chair Sporting by Mooven our Memoratry of New York City con the Dispersor Anna you Tunes Conservers Years. Scale, 1 in -2.200 deaths.





Do. t.

curve for both groups is lowest in the months of October and November, which may therefore be considered the healthiest months in New York. The highest mortality is in the first month of age. During this time twenty-five per cent of the deaths of the first year occur. Eross, writing in 1894, states that from the records of sinteen large cities of Continental Europe nearly ten per cent of all the infants horn field during the first month. These figures have been considerably reduced sirer that time.\(^1\) The first weeks of life are the period of highest mortality, because in them takes place the adaptation of the organism to its environment. After this period each month shows a steadily declining death rate to the end of the first year.

Causes of Death at Different Periods.—The most frequent enters of infant mortality, according to the combined reports from the records of the cities of New York, Philadelphia, Boston, and Chicago, making a total of 44,216 deaths in the first year, are shown in the accompanying chart (Fig. 6).

The group, acute gastro-intestinal, includes chiefly diarrheal diseases in summer. The proportion of deaths from this cause is being greatly reduced; while the proportion due to acute respiratory diseases, chiefly pusumonia and brombitis, in increasing. Manuscous, prematurity, etc., include also congenital debility, immitten, and other conditions in which the cause of death recorded is diseaser of nutrition rather than some general or local disease. The group, congenital malformations, includes

[&]quot;The relative frequency of the causes of death in the newly bern has been greatly altered since the introduction of antiseptic midwafery. Some idea of the importance of the different factors has been gained from a study of the records of the Stone Hospital for Women for a period of six years (1908-1914), callegoing 10,000 consecutive births.

CAUSES OF	DESTR	DUBLING FIRST	TOTAL PROPERTY.	or nave

		Under Our Day		Unite 7 Days		News th 18 Decr		Total Under 24 Days	
Congrainal weakness Associate of labor Porconnais Astolicitate Composite explaint Composite explaint Mediomethiage Stepsie Asportis Asportis Asportis Confessal Confessal Confessal Confessal Confessal Confessal Confessal	10 mm	New Port of the Party	190	THEM SHAPE	14 37-6	京 日本 一	134	seesall-Elle	10 H 20 H
Tidale.	195	200	335	56	16.	34	159	132	294

Tru thousand confinements. Abortions, 252 purification 229, Bring Metha, 9,518. (Prematures, heavy type). Holt and Stablett, June American Med Asso, June 25, 1915.

Needs titll of the total mortality for the period covered was ascribed to compared weakness, chiefly due to prematurity. also deaths from accidents during birts. Whosping cough is the most important member of the group of scute infectious diseases, diphtheria coming next. Tuberculesis should, we believe, he rated higher than is shown in these figures. The mortality records of the Eulers' Hospital show that the deaths from tuberculesis constitute 5.6 per cent of the Eulersyear mortality of that institution.

The figures and charts preceding indicate that a very marked reduction in infant and child mortality has taken place especially within the last twenty years. Many causes have united to bring about this result. Among these which have affected infants may be mentioned:

ACUTE GARTRO INTESTINAL	26.0	PER	CEN
MARASMUS PREMATURITY, ETC	25.6		,
ACUTE RESPIRATORY	10.5	-	6
CONGENITAL MALFORMATION, ETC.	0.8	G.	
ACUTE INFECTIOUS	8.4	A	
CONVULSIONS	2.4	8	*
TUBERCULOSIS	2.0	ė	e
STPHILIS	1.2	6	**
ALL OTHERS	10.2		*

\$30.5.

A wider diffusion of knowledge of infant-feeding and hygiene; a great improvement in the general milk supply; the furnishing of pure, whele milk and of modified milk gratis, or at small cost, from milk depots; a general adoption during but weather of some form of milk sterilination; the sending of a large number of infants into the country in summer; the closer supervision of infants in cities during the summer by visiting physicians and nurses, and the operation of many other agencies to improve sanitary conditions. Besides these important factors in preventing disease there must be considered the recent advances in pediatrics and the more rational treatment of the sick infant by the average physician.

During the second year the diseases of the gastro-intestinal tract are still a large factor on the death rate, also the neute diseases of the lungs and the neute infectious diseases, especially mendes, diphtheria, and pertussis. Deaths from scarlet fever are much less numerous. General tuberculosis and tuberculous meaningitis are frequent.

From the second to the lifth year the deaths are usually from acute infectious diseases—chiefly diphtherin and scarlet fover—much less frequently from measles or pertussis. In the next group come the acute diseases of the lungs, general tuberculosis, and interestors meaningitie.

From the fifth to the lifteenth year the mortality in childhood is remarkably small, diphtheria and searlet fover being still in the front rank in point of frequency. Next come the scate diseases of the lungs, meningitis, diseases of the boxes, appendicitis, rheumatism, and cardiac disease.

By far the largest single factor in reducing mortality after the first year is without doubt the use of diphtheria antitoxin. The serum treatment of cerebrospinal meningitie is important, but not influential in vital statistics, as cases are relatively infrequent.

Sudden Beath.—This is not a very uncommon occurrence in infants who are apparently healthy. They are sometimes found dead in bed under circumstances in which grave suspicion may unjustly rest spon the attendants. This usually happens with those who are delicate or suffering from malnutrition, especially in institutions where sudden death is by no means rare. The most frequent causes in infants are the following:

- 1. Malformations.—While in most cases malformations of a serious nature give rise to symptoms, they may be absent, or may be so slight as to be corrlooked. Infants may encumb during the first few days of life from malformations of the heart, lungs, kidneys, stomach or intestines, and sometimes from displinaments or unfolioul hernia.
- 2. Internal Hemorrhays.—This is chiefly limited to the first two weeks of life. In the cases that have come to our notice the cause has been rupture of some subperitoneal hemorrhage into the general abdominal cavity, or meningeal hemorrhage. Such cases are reported in the chapter upon Visceral Hemorrhages in the Newly Born. Under these circumstances no symptoms may exist until the occurrence of collapse, with death in a few hours.
- 3. daphyris from Overlying.—This is not common, except among the lower classes, and is most frequently due to intoxication on the part of the mother. Such infants after death present the neual lesions of death from asphysia, but without any swidence of violence. It is not improbable that everlying has been held responsible for many deaths that were in reality due to other causes.
- Asphyrio from Aspirelion of Food into the Larynz or Pracket.
 —This may be due to vomiting or to the regargitation of food fluring sleep; in a very weak infant it may occur while awale. This is usually

seen in infants who are less than a year old, and most of the reported cases have been under six months. Such children are usually delicate. There seems to have been comitting with an attempt at crying, during which the fixed is drawn into the air passages. In some cases, as that reported by Demme, a sugle large surd of milk has been found in the largux. In others, fixed is found in the largux, tracker, and large bronchi. Cases have also been reported by Partridge and by Parrot, and we have not with at least these. The infants have generally been found dead in bed within a few hours after feeding. This accident is more likely to tappen when an infant lies upon his back,

- 5. Enlargement of the Thymne.—Although these cases are very imperfectly understood, they are not rare. We see two or three each year. The condition is most frequent in infancy, but is not confined to this period. When a child is suffering from some minor illness, often bronchitis, severe attacks of asphysia may develop and sometimes convulsions may unexpectedly occur and douth soon follow. Or the first attack may not be fatal. Sometimes sudden death follows the administration of an anothetic, particularly chloroform. In most cases there is found besides an enlarged thymns, a general hyperplacia of the lymphatic tissues throughout the body known as status (purphaticus, more fully discussed elsewhere.)
- dielectasis.—In very young infants there may be no symptoms noticed except those of general malnutrition until sudden death occurs, sumetimes with convulsions and sometimes without any such symptoms. (See Atelectasis.)
- 7. Marassus.—In this class of cases sudden death is of very common occurrence. These children are often apparently as well two or three boars before death as for several works. Death frequently occurs at right, the children being found dead in bed in the morning. In some of the cases the exciting cause seems to be the lowering of the temperature, while in many no exciting cause can be found; the vital spark simply goes out after burning for some time with a feeble intensity. In some of these cases the autopsy reveals atelectasis, but in many cases pething almoranal is found, death apparently resulting from heart failure.
- 8. Convalsions in Children Previously Stowing no Special Signs of Bioress.—Many of these cases are seen in children who were previously rachitic; some are associated with the status hymphaticus, and many are manifestations of tetany. The autopsy may show no leavest except cerebral hyperemia. It is extremely care for cerebral hemorrhage to produce death in this way. In some rachitic cases death is due to spasm of the glottia.
- 9. Asphyria to Other Infants and Young Children.-This may result from the pressure of a retropharyngeal abscess upon the largus or

traches, or from the repture of such an above into the six passages. Previous symptoms may have been wanting. Pressure upon the puru mogastric nerve leading to fatal asphyxia may be caused by tuberculous broughful nudes, or by abscesses in the posterior mediantinum connected with caries of the spine. Sudden death may occur with spinal caries from dislocation of the upper cervical vertebras.

Sudden asphyxia may follow the electation of tuberculous lymph nodes and the escape of cheesy masses into the traches or primary bronchs. This usually occurs in children from two to five years old.

10. Death after a Few Hunes' Illness, in which the Chief Symptom is High Temperature.—This is not an uncommon occurrence. Infants apparently well may be taken with great prostration and a high temperature, which may rise rapidly to 100° or even 107° F., and death follow in from six to twelve hours, sometimes preceded by convulsions. These are often examples of acute repticeums, most frequently from the pren-mococcus, sometimes from the streptococcus, or other organisms. In older children death may be due to mulignant searlet fever or epidemic meningstis; however, unless these diseases are prevailing epidemically, it is somewhat hazardous to make such a diagnosis.

It does not fall within the scope of this chapter to consider such cases of sudden death as those which occur from heart failure after diphtheria, with plearisy with effusion, or with myocarditis. These will be discussed observates.

PROPHYLAXIS

There is no more promising field in medicine than the prevention of disease in childbook. The majority of the ailments from which children due it is within the power of man in great measure to prevent. Prophylaxis should aim at the solution of two distinct problems: (1) The removal of the causes which interfers with the proper growth and detelopment of children; (2) the prevention of infection. The former can come only through the education of the profession and of the general public, in the fundamental principles of infant feeding and hygiens. This is a department which has received altogether too small a place in medical education. The latter must come through the profession and through legislation the purpose of which shall be more rigid quarantine, more thorough distance tion, and improved similation in all its departments. The subject of prophylaxis will be discussed in connection with the different diseases treated elsewhere.

THERAPEUTICS

Therapeutics in infancy consists in something more than a graduated doinge of drugs. Many therapeutic means which are valuable in adults are useless in children, and many others which are of little value in adults are extremely useful in children. Children in the past have suffered much from sycrocalous treatment, particularly from druggiving. In early life more than at any other period the old dietum non nozero should be heeded. It should be a fundamental principle never to give a dose of medicine without a clear and definite indication. If this rule is followed, it is surprising to find how often medication can be dispensed with. A second rule is equally important; never to give a museous dose when one that is palatable will answer the purpose equally well. The simpler prescriptions are mide, the better. As a rate, infants result against most of the highly seasoned simps and elixire which are used to disguise the tasts of unpleasant doses. Bitter needicines, when mixed with water, are frequently administered without difficulty.

It is a common mistake to underestimate the importance of the hygienic surroundings of the patient, the value of good nursing, careful feeding, and judicious stimulation, just as it is to overestimate the boneficial effects of drugs. In the great unifority of acute adments not serious in character, for which a physician is called, the patient recovers quite as promptly without drugs as with them. This does not mean that such children require no treatment, but that the least important part of the treatment is drug-giving. In cases of severe illness, in infants especially, we must aroud all unnecessary medication, in order that the stomach may not be disturbed. Hence the importance of relying as far as possible upon local measures. The strong tendency to recovery from all acute processes, while seen in abilt life, is even more striking in childhood, where, if we can but remove that which hampers the hodily functions. Nature will as unlly conduct the case to a satisfactory termination. Thus, after an attack of branchitis, it is often seen that the disturbance of the stomach and intestines can be directly traced to the strugs employed, and continues long after the original disease has subsided. In diseases of the storach and intestines especially there is a great amount of unnecessary medication. In all chronic disturbances of nutrition-chronic indigestion, malautrition, and anemia-no tonic is so good as a change of air and surroundings.

Antipyretics.—The indications for the employment of antipyretics in children are somewhat different from those in adults. It is to be home in mind that, where the cause is similar, all temperatures in children are higher than in adults. Thus conditions, which in an adult would produce a rise of temperature of only 100° or 101° P., in a child are not infrequently accompanied by a temperature of 104", or even 105° F. 'The height of the temperature, as measured by the thermometer, is not to be taken as the only or even the best guide for the employment of antiprretice. The nervous disturbance which accompanies such a temperature is much more important. The temperature may be 101", or even 105° F., and set the child exhibit no signs of unmeral discomfort. Such a temperature manifestly does not call for interference. High temperature from apparently trivial causes is very common. It is only a continuously high temperature or a recurring high temperature which indicates serious illness. Whenever the temperature is found to be much above the normal it should be carefully watched, but not interfered with until a diagnosis has been made, unless the symptoms argently demand it; otherwise the physician may lose one of the most valuable aids to diagnosis, since it is not the height of the temperature but its course which is significant. In many cases it is very important to know whether the temperature uninfluenced by drugs is remottent, intermittent, or steadily high, and hence the advantage of waiting until a diagnosis has been made before disturbing the temperature curre. This is, of course, not admissible when the temperature is itself a source of real danger, which after all is seldon the case. Since the cause of a great many obscure temperatures is found in the storach and intertines, it very often happens that a purgative, stomach-washing, or intestinal irrigation may be the most efficient antiporetic. In cases of moderate elevation of temperature we need go us further than cold sponging.

The most reliable antipyretic measure for children is the use of oald,

This may be employed-

 As an Ice Cap to the Heaf.—In many cases of quite high temperature and restlessness in infants this alone will reduce the tem-

perature one or two degrees and allay the nervous symptoms.

(2) Cold Spanging.—For this purpose water at about 80° to 85° F., equal parts of alcohol and water, or equal parts of vinegar and water may be employed. In the case of infants, all the clothing except the disper should be removed and the child laid upon a blanket. The body should be sponged for from ten to twenty minutes, and then wrapped in a blanket without further dressing. Cold sponging must be very frequently employed in order to be efficient in reducing high temperature. Its great value in allaying nervous symptoms, even when the temperature is not very high, is not sufficiently appreciated. Its effect is often more satisfactory than that of an anodyne.

(3) Cold Pack.—The child should be stripped and laid upon a blanket. The entire trunk should then be enveloped in a small sheet. wrang from water at a temperature of 100° F. Upon the sutside of this, ice may now be mided over the entire trunk, first in Iront and then behind. By this method there is no shock and no fright, and any ordinary temperature can usually be readily reduced.

The rubbing with ice should be repeated in from five to thirty minutes, after which the child may be relied in the blanket upon which he is lying without the removal of the wet puck. The head should be sponged with cold water while this is being carried on, and artificial heat, if necessary, should be applied to the feet. The pack is continued from one to twenty-four hours, according to circumstances.

- (4) Cold Bath.—The child is put into a bath at a temperature of 100° F., the temperature being gradually lowered by the addition of ion or cold water to 75° or 80° F. The body should be well rubbed while the child is in the bath and water should also be applied to the head. Ou removal from the bath, the body should be quickly dried and rolled in a warm blanket. The bath is usually continued from five to ten minutes.
- (5) Eusperstion Bulk.—The trunk is closely enveloped in two-layers of surgeon's game, or some bosely weren equivalent, which is moistened from time to time with water at a temperature of 95° F₋ continuous evaporation being look up by means of a hand, or better electric, fam. The evaporation bath would seem to possess some important advantages in the case of infants and young children, in that it is more efficient than sponging, involves little disturbance of the patient, and curses no shock or fright. Hot applications should constantly be made to the extremities.
- (6) Recful Irrigations.—These are easily given, disturb the patient very little, and are effective in reducing the temperature. A double tube at two catheters may be employed. It is best to use at first water at a temperature of 20° F., and gradually reduce this to 70° F. The irrigation should be continued for ten or fifteen manutes, or even longer if the desired fall in temperature is not obtained, and may be repeated as often as every three hours.

Antipyretic Drugs. - Except in cases of malaria, quinin should not be employed for the reduction of temperature in children.

Of the many coal-tar derivatives comployed, phenocetin has the advantage for children of being tasteless and causing little depression, but the slight disadvantage of practical imminishing. None of the drugs of this group is, however, to be employed in large doses with the sole purpose of reducing the temperature. Their great value in pediatrics consists rather in allaying the nervous symptoms which accompany fever, and this purpose can be accomplished by the use of comparatively small doses. To an infant of one year, phenocetin can be given in one-grain doses every hour or two hours until the desired effect is produced. For

a child of five years a dose of two grains may be given in the same manner. When used as indicated, these drugs are of very great value in making the patient more comfortable, in promoting sleep, and in allaying headache and general pains. In cases of hyperpyrexia they are, however, much less certain and less safe than the use of sold.

Sedatives.—For most of the milder conditions where sedatives are required bromids are to be preferred. A preference should be given to the sodium salt. Young children require relatively large doors: e.g., in somewhere conditions five grains every two hours are often necessary at three menths. Chloral is usually well borns even by quite young infants. Since it is often irritating to the stomach it may be advantageously given by the rectum. After rectal administration its effects are usually manifest in half an hour, and sometimes somer. The rectal door for an infant of one month is one grain; three months, two grains; one year, three to five grains. It may be repeated every two to four hours, according to indications. Doses by mouth should be about half as large. Other drugs may replace this in most discusses, but in the case of infantile convulsions nothing is so reliable as chloral.

Belladonna is well borne by children, and in relatively larger doses than most drugs. The eruption is more readily produced than the other physiological effects, and even quite small doses may be sufficient to bring out a very abundant blush. The parents should be advised of this fast, lest undue alarm be felt.

The drugs classed as antipyretics—phosacetin and antipyrin—are exceedingly valuable in the treatment of many diseases of infancy where irritative nervous symptoms are promonent. In many cases they may advantageously take the place of openin except when pain is present. In all conditions where spaces is a prominent symptom, whether of the largest or besnelsi, or local or general convulsions, antipyrin is especially valuable.

Stimulants.—Alcoholic stimulants are well tolerated even by young infants; yet all stimulants, alcohol in particular, are very greatly abused in the hands of practitioners, and their indiscriminate and protracted use can not be too strongly condemned.

The indications for the employment of stimulants are much the same in young children as in adults. In most of the scate fevers they are not to be given early in the disease, and in many cases they are not required at all. They must often be used very sparingly while the temperature is high, but may be necessary as seen as it falls. In many scale febrile diseases stimulants are not called for at any period.

The nothed of administering alcohol is of no little importance. Brandy and whisky are in most cases to be preferred to the triass, but not always. For infants under one year old, brandy should be diluted with at least twenty parts of water. Altogether the best method of administration is to determine the amount to be given in every twenty-four hours, have it diluted sufficiently, and then administer it in small does at short intervals.

An infant one year old for whom alcohol is indicated should not be given to begin with more than one-fourth of an ounce of brandy or whisky during the twenty-four hours, and even in had conditions it is rarely advisable to give more than twice this quantity, except for a very short period. In chaldren four years old double the amount may be employed in the corresponding conditions. Little good and much berm is likely to follow such amounts as four or five sances daily of brandy or whisky for children of two or three years. There cortainly is a strong tendency at the present time to use less and less alcohol in thempenties and many would abandon it altogether.

Other stimulants, caffein, comphor, strychnin, digitalis, strophanthus, etc., are used in children with much the same indications as in adults. Their application is more fully discussed in the different discuss in which they are employed. They may be used in the following does at the different ages indicated:

	2 mooths	J.yest.	5 years.
Digitalis, tincture Stropharithen, tincture Caffein citrated Strychnin sulphate Campitor (10 per cent solution in sil) Epinepharis (1-1000 Sol.)	Gr. i. Gr. i. Gr. ii.	R III R III Gr. sh R x R xi	Gr. ii Gr. ii Gr. ii H xx

Norn.-Campher and spanephrin are for hypodermic use only.

Tenirs.—Cod-liver oil is particularly useful in the convalescence after acute diseases of the respiratory tract, in sacmia, and with a large number of children who are extremely delicate. In these patients it may be advantageously administered throughout the greater part of nearly every winter season. In convalescence after attacks of gastroenteric disease it should be withheld for a long time. When the tongue is coated, the digestion poor, and the stomach easily disturbed it should not be given at all. In the case of infants, as a rule, the pure oil is to be preferred to the emulsions. The administration of small doors—i. e., ten or twenty drops of the oil three times a day continued for a long period—is oftenbetter than the use of larger doses for a shorter time.

Preparations of malt are sometimes of even greater value than andliver oil, for they can be used in many conditions when the oil is contraindicated. The two may often be advantageously combined.

The best preparations of iron for very roung children are the letter

wine, sweet wine, succharated carbonate, and the wine of the citrate. These are only slightly constipating, and many of them can be given with rolls. Most of the arganic preparations on the market are less reliable than those mentioned. For older children nothing is better than reduced iron or Bland's polls.

Arsenic is second only to iron in the treatment of the anemia of children, and in very many cases it is to be preferred to iron. The tablet triturates of arsenious acid, one one-hundredth of a grain, may be given immediately after meals three times a day, or one or two drops of Fowler's solution largely diluted with water.

Alcohol is useful in combination with some of the bitters, either small doser of quinin, more comion, or the bitter wine of iron. Usually wines, especially sherry, are to be preferred to specials, although some children take spirits better. When combined with a bitter there is little danger of the formation of the alcoholic habit, even though its use may be long continued.

Of the hitter toxics, mux rumica is easily superior to all others.

Opiates.—Strong objections have been urged by many against the employment of opcome in the discusse of infancy. While opintes have no doubt been abused, the fact remains that opcome is almost as valuable a remely in the treatment of discusse during the first five years as at any other period of life. For infants relatively smaller doses are required than of most drugs. If the physician will account himself to the use of small doses, he will be surprised to see how satisfactory are the effects produced,

The most useful preparations for young children are puregoric, Dover's powder, the decelorized tincture, morphin, and codein. The following table gives what may be considered safe initial doses at the different ages:

	America.	3 months.	2 5 year.	Syman
Pareporie Desderined tineture Dover's powder Morphia Codem	M. I. M. W. Gr. ob. Gr. ob. Gr. ob.	R II R II Gr. III	Ryling Sites Gr. i Gr. is Gr. is	Microsto di Si il to ili Ge. A Ge. A Ge. A

Ordinarily does like the above should not be repeated oftener than every two hours. In exceptional circumstances, as when very great pain is present, the does may be given more frequently. In the hypodermic use of morphin it should be remembered that its effects are always more uniform and striking than when the drug is administered by the mouth, and the does should therefore be smaller. In every instance where a full

slose of opium has been given the physician should wait until the effectshave subsided before the dose is repeated.

Drags Well Berne by Children.—In this list may be mentioned belladanna, the bramids, the indials, chloral, quinin, calomel—in fact, all mercurials—and opium also, though not all of its products.

The drugs not well borne include particularly cosmin and heroin. In the case of many others, while the constitutional effects are well telerated, they must be given carefully to young infants, since they are irritants to the stamach. In this class may be mentioned the miceylates, salol, the astringent preparations of iron, and the acids.

Vaccines.-These are suspensions of dead bacteria in a normal salt solution. Their application in polistries is confined to therapeuties; as a prophylactic measure they are seldem called for, except for the prevention of typhoid fever. Vaccine therapy has been employed in almost every form of bacterial infection. In the great majority of these the results have been disappointing. They are of unquestioned value in localized staphylococcus infections, particularly those of the skin, e.g., general furunculous and larger multiple aboosses. In other staphyloroccus infertions they are sometimes useful, but results are very uncertain. In streptococcus infections whether localized or general their effect is doubtful; although in rare cases they have seemed to be of benefit. Pasumococcus infections are apparently not at all influenced by their use. Regarding the effect of vaccines on gonococous infectious of mucous memleanes, one must speak very guardedly. The great majority of patients with gonococcus vaginitis so treated have received but temporary benefit, although a few striking cures have been obtained. Colon bacillus infections of the urinary tract (prelitis) sometimes appear to be decidedly improved by vaccines. With respect to most other conditions experience thus far does not warrant one in forming a sanguine opinion of their value. For the technic of vaccine treatment special works should be consulted.

Counterirritants.—These are of great value in a large variety of dis-

The mustard paste is probably the most satisfactory means of producing quick counterirritation over a large surface. To make a mustard paste: Take one part powdered mustard and six parts of wheat flour, mix with lakewarm water, and spread between two layers of muslin. This should be removed as soon as a thorough reduces of the skin has been produced—in most cases from five to eight minutes, according to the strength of the mustard employed. This may be repeated as often as every three bours, and continued for a week if necessary, without producing exceptations of the skin. For older children the paste may be made one part mustard to loar parts flour. In polinomary discusses it should be large snough to surround the chest. When it is used to produce general reaction in heart failure it should cover the entire frunk.

The Masterd Pack.—The child is stripped and laid upon a blanket, and the trunk is surrounded by a large towel or sheet esturated with mustard water. This is made as follows: One tablespoonful of mustard to one quart of topid water. In this a towel is disped, and while dripping wound around the entire body. The patient should then be rolled in the blanket. This pack may be continued for ten or differen minutes, at the end of which time there will usually be a very decided redness of the whole body. It may be repeated according to indications. Where it is desired to produce a general counterirritation, the mustard pack is not quite as efficient as the mustard bath, but it has the advantage in causing much loss disturbance to the patient. The mustard pack is useful in the condition of collapse or of great prostration from any cause whatever, in convalsions, and in secondar or pulmonary congestion.

The turpentine stage is made by wringing a piece of flumed out of water as hot as can be borne by the hand. Upon this is sprinkled ten or fifteen drops of the spirits of turpentine. The stape is then applied to the body and covered with oiled silk or dry flamed. It is useful chiefly in abdominal pairs or inflammations, but in infancy must be carefully watched or restoation will be produced. For frequent use it is not so valuable as the mustard pasts.

Stimulating liminators containing turpentine and other irritants are useful in inflammations of the chest, although less reliable than the mastard paste. One of the mildest and most useful preparations is campborated oil. Another is cline oil four parts and turpentine one part. These may either be rubbed upon the surface, or a piece of flannel may be saturated with them and then applied to the skin.

Local Blood-letting — Leeches are sometimes useful in the early stages of acute inflammations of the masterid or middle ear. They may also be applied to the precordium in acute pneumonia with signs of failure of the right leart, viz., great dyspace and cyanosis.

Dry caps may be used even in young infants, to relieve scute congestion in prevenuccia or bronchitis, and for pulmonary edems. Wet cups should never be used for young children.

Paultices are much too frequently employed and may with advantage be omitted in the treatment of most local inflammations. They have been largely replaced by wet dressings, especially those of aluminum acetate. In acute pulmonary inflammations their use is very limited.

Cold.—Cold is useful in almost all forms of local inflammation. In inflammation of the cervical lymph glands and of the joints it is of undoubted value, but its advantage over heat is questionable. The efficiency of both cold and heat in these cases depends largely upon the method of use. The difficulties in the way of their proper application are great in young children. Sometimes in plearies much greater relief is obtained from the use of an ice bug to the chest than from hot applications, but this is not the general experience. The treatment of preamonin by the application of the ice bug to the chest has many advocates, although in our hands it has not yielded the results claimed for it. It is admissible only in totar pneumonia, and here chiefly in older and stronger children. The application of cold in young or very delicate children should be made with caution in all inflammations of the respiratory tract.

Cold is best applied to the head by an ice cap made like a belinet; an ordinary robber se flamed bag filled with ice may answer the purpose. The rubber cold filled with see water is also an excellent method. For inflamed glands or joints the ice bag or the cold should be used; for the eyes, cold compresses, changed every minute.

The Hot Pack.—All clothing is to be removed and the child's body covered with towels wrong from water at a temperature of from 100° to 108° F, after which the body should be rolled in a thick blanket. These but applications may be changed every twenty or thirty minutes until free perspiration is produced, which may be continued as long as necessary. This is mainly useful in uremia.

The hot bath, like the mustard pack or the mustard bath, may be used to promote reaction in cases of shock or collapse. The patient should be put into the bath at a temperature of 100° F., the water being gradually raised to 100°, or even to 100°, but not above this point. The body should be well rubbed while the patient is in the bath. A thermometer should be kept in the water to see that the temperature does not go too high. Unless this precaution is taken the danger of burning the child is great. During the bath, in most cases, cold should be applied to the head.

The Hot-Air or Vaper Bath.—All the clothing should be removed and the patient laid upon the bed with the bedclothing raised above the body ten or twelve inches, and sustained by means of a wacker support. The bedclothing should be pinned tightly about the neck, so that only the head is outside. Beneath the bedclothing hot vapor is introduced from a cross kettle or a superiner. This will usually induce free perspiration in fifteen or twenty minutes. It may be continued from twenty to thirty minutes at a time. Instead of tapor, but air may be introduced in the same way. The air space about the body is indispensable. The vapor bath is applicable chiefly to cases of uremia.

The Mustard Bath.—Four or five tablespoorfuls of powdered mustard should be mixed for a few minutes with one gallon of topid water. To the should be added four or five gallons of plain water at a temperature of 100° F. The temperature of the bath may be raised by the addition of hot water to 103° or 106° F., if desired. Nothing is more efficient than the hot mustard bath for a general derivative effect in beinging the blood to the surface in cases of shock, collapse, heart failure from any cause, or in sudden congestion of the lungs or lowin. The bath should not usually be continued for more than but minutes. If necessary, it may be repeated in an hear.

The Bran Bath.—Put one quart of ordinary wheat bran in a bug made of course muslin or choose risth and place this in four or five gallons of water. The bran bug should be frequently agreezed and moved about until the buth water resembles a thin porridge. It may be of any temperature desired, but usually about 90° to 95° F, is best. A bran bath is of great value in cases of eccens, excertations about the buttocks, or in other cases where the skin is very delicate, and plain water seems to scritte it.

The tepid bath may be given at a temperature of 25° to 100° F. It is very useful in many conditions of excitement or extreme nervous irritability. To induce sleep it is often more efficient than drugs.

The cold speage or the shower bath should be given in the morning before breakfast, and in a warm room. The child should stand in a tish containing warm water enough to cover the feet, then a large sponge holding half a pint of water at a temperature of from 40" to 60" F. should be spaceed three or four times over the class, shoulders, and spine of the child, the skin being rubbed meanwhile. The bath should not last more than half a minute. It should be followed by a brisk rubling until a thorough reaction is established. This is very useful at all ages, but it is a particularly valuable tonic in delicate children. It may be used in those only eighteen months old. Not the least of the beneficial results is the full expansion of the lungs from the strong cry which the both usually excites. In younger infants a cold plunge may be substituted. This should be merely a single dip-of the entire body in water at a temperature of 50" to 60" F. In order that beneficial effects shall follow the cold plunge or cold spunging, a good reaction must be established. If children lack sufficient vitality to occurs this, and if ther remain pale, pinched and blue for some time after the bath, it must be discontinued altogether, or water of a higher temperature used.

Nasal Spray.—This may be either of an aqueous or an oily solution. For the oil spray an atomizer should be employed. It is valuable in cases of dry catarrh, where there is a formation of crusts in the nose. A variety of oils may be used, bearound being perhaps as satisfactory as any.

There are many forms of hand atomizers to be found in the market for the production of aqueous or oil sprays. For a cleansing usual spray, Debell's solution, Scaler's solution, or a two-per-cent solution of borie acid may be used.

Nasal Irrigation.—In cases of considerable ansal obstruction and in the more serious affections of the rhinopharynx, only the springe can be considered an efficient means of cleansing the cavity.

The fountain syringe has the advantage of being easily regulated as to the force employed, thus being determined by the height at which the bug is suspended above the bed. For ordinary purposes an elevation of one or two feet is sufficient, and rarely is a greater pressure than three feet advisable. The last is desirable when a thorough flushing of the reinopharyux is required. The danger of forcing fluid into the middle our is greatly becomed if the patient keeps the mouth wide open.

Where a smaller amount of fluid is sufficient a piston syringe may be employed. This should be small enough to be easily worked with one hand. It should have a soft rebber tip, to prevent injuring the most mixous membrane, and the tip should be large enough to fill the rostril. The piston syringe for most use is made either of glass or hard rubber, and fulfils all the conditions mentioned. It is easy of action, can be readily cleaned, and holds about half an ounce. The same syringe should not be used for more than one patient, unless it has been very thoroughly disinfected. In hospitals, and even in private practice, usual syringes are frequent carriers of infection.

Either of two positions may be used in most syringing. In diphtheria, scarlet fever, or any constitutional disease attended by great depression, the child should not be removed from the bed. The syringing may be done by a single nurse, who stands at the head of the bed, alternately syringing the right and left nostril, turning the head from side to side. The other method is to hold the child exect on the lap, with the bend inclined somewhat forward, the syringing being done by a second person standing behind. In either position the child's arms and hands should be accurely pinioned to the sides by a sheet. To make sure that the rhinopharyax has been reached the water should return through the apposite nostril or the mouth. When properly done, no prestration and very little irritation are caused. The bulb (Davison) syringe should not be employed for usual irrigation; as the pressure can not be satisfactorily regulated, fluids are likely to be forced into the Eustachian tubes.

Syringing the mouth and pharynx is useful in many pathological conditions of these parts, particularly in children too young to gargle. Either the fountain, piston, or built springe may be used. If the pharynx is to be reached, the nearle is used as a tongue depressor. This should be placed at the angle of the mouth between the back teeth. The child should lie upon the side or be hold in the sitting posture, with the head inclined forward. Only bland solutions should be employed. Inhalations.—These are of very great utility in all affections of the respiratory tract. To be efficient, the putsent should be put under a tent. A satisfactory tent may be made by creeting a T-shaped piece of wood at the head and foot of the crib and throwing over this a large sheet folded and pinned at the corners. Another method is to stretch a cord around the top of each of the four posts of the crib, or simply aroun the center of the head piece to the center of the foot piece; the sheet should be used as in the first instance. A very good tent may be improvised by throwing a large sheet over an open numberlia. The better the tent the more satisfactory are the results.

Inhalations may be in the form of vapor or spray. The apparatus employed may be the croup kettle, the vaporizer, or the steam atomizer. As all of these are used with alcohol tamps, innumerable accidents from fire have occurred with them. Patients and nurses should always be cautioned regarding this. Whenever possible, the electric heater should be substituted. The ordinary croup little is a clumsy affair and especially likely to be the curse of accidents.

There are various forms of apparatus for the purpose of obtaining medicated inhalations.

Stomach-washing or gastric lavage consists in the introduction of water into the stomach through a flexible catheter or stomach take and then siphoning it out. It is one of the most valuable therapeutic neaures we possess. The procedure is very simple, and may be considered entirely free from danger; in fact, it is difficult to pass the tube any where else than into the cooplagus. The amount of prostration produced by stomach-washing may be compared to that of an ordinary attack of varniting.

The appuratus for gastric lavage consists of a sidt-rabber natheter, size 16. American scale (24 French)—one with a large eye is preferred; a glass funnel, hobling four to six omeen; two feet of rubber taking, and a few inches of glass taking to join this to the catheter. The child may be held in a sitting posture or placed upon the back; the holy should be well protected by a rubber sheet, with a large basin conveniently near. The catheter should be mostened. While the tongue is depressed with the forefinger of the left hand, the eatheter is proved expidly back into the pharynx and down the cooplingus. It is important that the first part of the introduction should be as rapid as possible, for if the child begins to gag from the pharyngeal irritation the introduction of the tube may lie. quite difficult. No resistance is ordinarily encountered after the fule reaches the coopliague. About ten inches of the catheter should be passed beyond the lips. When it his reached the stomach the framel should be raised as high as possible, to allow the escape of gases almost insuriably present. It should then be lowered, in order to sighon out the fluid cuttents. If nothing escapes, the funnel is then to be raised and from two to six oursess of water poured into it from a potrher; this funnel is then burened and the water siphoned out. This procedure is repeated from four to ten times, or until the fluid comes back riear. About a quart of water is ordinarily used. Various solutions have been advised for stomarh-washing, but nothing is better than builed water, used at the temperature of from 100° to 110° F.—the higher temperature being emplayed when the gastric irritation is very great. If mucus is present in the stomach an alkaline solution (becarbonate of sola, 3j to 0j) is preferable. Through the tube are untily discharged mucus and small cards; larger ones are gradually broken down by repeated washing. Vonating may be induced by overdistending the stomach with water. If there is great thirst there is often an advantage in leaving one or two success of water in the stomach. To this water it is at times beneficial to add lime water.

Gastrie larage in its application is practically limited to children under two and a half years. It is excised in those under eighteen months. Children of three years and over are usually so much slarmed and struggle so violently as to make it difficult and undesignible.

The indications for large are: (1) Arute gastric indigestion, either with or without persistent voncting. Here the purpose is simply to clear the stomach of its irritating contents, and a single washing may be sufficient. (2) Chronic indigestion attended by the production of gastric muscus. (3) Dilutation of the stomach. (4) Hypertrophic straces of the pylorus. (5) Prisoning.

Gavage.—Gavage consists in the introduction of food into the stomach by a tube passed through the month. The same apparatus is employed as in lavage, and the method is similar, with the exception that for gavage the child should be placed upon the back, the bend being steaded by an assistant. With older children a mouth-gag is often accessary. After the tube has entered the stomach the funnel should be raised to allow the gas to escape. The food is then poured into the funnel; as soon as it has disappeared the tube is tightly pinched and quickly withdrawn, to prevent food from trickling into the pharyna, since this is often a cause of vomiting. If the food is regargitated this usually luppens at oner. It may then be introduced a second time. After feeding, the child should be kept absolutely quiet upon the back.

In cases where all the food is given by gavage the interval between feedings must be considerably longer than under other circumstances. Sunctimes the food given mur be partially proligested, since digestion in these cases is nearly feeble. The stomach should be washed before each feeding, in order to remove mucus and to be some that it is empty before the meal is given. tintage is valuable in the feeding of premature infants and after certain operations upon the mouth and neck. It is also useful, first, in the case of some very young infants, who, suffering from severe mainutrition, can not be induced to take local enough to eastern life; secondly, in many acute discusses, particularly in septic cases when the child will not readily take the necessary feed, as in diphtheria, scarlet fever, typhical, prenments, etc.; thirdly, in many cases of surebral discuss where feed is refused on account of delirium or come; and, fourthly, in some cases of persistent vomiting.

Gavage is a very simple procedure and one which a nurse can rasily be taught. Not only may food be given, but also medicines and stimulants as may be required, with little or no trouble. The advantage of gavage over the continued maxing or helding the ness and foreing the

patient to swallow, will be at core apparent to one using it,

Nasal Feeding.—The method is similar to gauge, the only difference being that the tube is passed through the nose, and consequently a much smaller one is used. No. 10 American or No. 16 French scale is a proper size. Nasal feeding is applicable to children over two years old, in whom the tube can addem be passed through the asouth without the use of a gag, and then only after much struggling. It is of value after intufation, trackectomy, and other operations about the throat, also in some cases of throat paralysis, especially after diphthesis.

Irrigation of the Colon.—By irrigation of the colon is mount the flushing of the entire large intestine by fluids injected high up through a cutheter or rectal tube.

The apparatus required for irrigating the colon is a fountain syringe. five or six feet of rulder taking, and a flexible exctal rule or soft-rulder outhoter-No. 26 or 27, French scale, being preferred. Kemp's doublecurrent tube of hard or flexible rubber is useful. The same result can be obtained by using two ratheters, the larger for outflow, the smaller for inflow. The child is placed upon the back, with the thighs flevel and the buttocks brought to the edge of the bed or table. He should be upon a Kelly pad or a rather sheet so arranged as to form a trough comptring into a large basin or tab. The lag containing the water is lung two or three fort above the bed. If a ratheter is used it is inserted just within the sphinster before the water is turned on. As it frees the catheter is gradually pushed opeard. The water distending the intestine in advance of the catholer usually makes its introduction quite easy. In Fig. 7 is shown the colon of an infant of six months in position. It is the peculiar curve and the great length of the sigmoid flavore that make the introduction of water difficult, orders the tube is inserted for some distance.

Usually a pint, and sometimes a quart, can be introduced before any

water returns. At least a gallon of water should be used for a single irrigation. The washing should be continued until the water returns quite clean. Change of posture and gentle kneading of the abdomen should be employed during the irrigation, particularly the early part of it, to facilitate the introduction of the water into the upper part of the colon. At the oud of the irrigation the rubber tube is detached and the water allowed to escape through the cuttester, which remains in site. Sometimes as much as a pint of water remains in the intestine. This is usually passed within half an hour. As the irrigation of the color almost invariably guites active peristalsis of the lower ileum, this part of the intestine is

emptied as well. It is to be rememhered that the colon of an infant sixmonths old will hold about one pint without distention, and at the age of iwo years from two to three pints.

Irrigation of the colon is useful to clear this part of the intestine of mneus, feeal matter, undigested food, and decomposing secretions. It may also be employed as a means of local medication in Bescalitie. Where the elect is simply to cleanso the intestine, a saline solution-a tempoonful of common salt to a pint of water-is preferred.

The temperature of the water used for irrigation may be varied accords Pm. 7 .- Conce or a Cama Sox Moscow ing to the special indications. For ardinary purposes, where cleansing



CLD, SHOWING THE NOT UNCCRESCO. BEHINT MINANT BOLMBERS

only is aimed at, a temperature of from htv to 100° F, seems to be best. When the body temperature is high, or when there is much pain, tenesums and straining, colder water has important advantages.

Irrigation under most corcumstances is required only once in twentyfour hours. It is important to use a large quantity of water. It must be done thoroughly to be of value, and either by the physician himself or an experienced nurse.

In collapse or great prostration hat saline injections may be employed for purposes of stimulation; the temperature of those should be from 105° to 110° F.

Enemata. Simple enemata are useful in infants and older children for constigution. When an immediate effect is desired the most efficient is one containing glycerin-e.g., for an infant, one teasusonful to one sense of water. (bil enemata (one-half to one outro) are notful when the feral mass is hard and dry and expelled with didicality. Emeranta
though always in given with care, and preferably a miller cutlistic should
be attached to the noutle of the certage.

Nutrient enemata have a limited application in infancy, as the rectum soon becomes intolerant. The quantity sujected should be small, rarely more than one or two conces, and the interval between injectious should be at least four hours. In older children they may be used as in adults. Glucose can be given in this manner when the stomach is intolerant. It is doubtful if other substances are sufficiently absorbed to be of much benefit.

The administration of drugs are reclaim is useful in certain cases when, on account of the amplement instruction to wonting, the administration by mouth is difficult—e.g., quinin and chloral. As a dilutest, graid is preferable to water. If quinin is used, the bindiphate is the test preparation, but this must be well diluted. The temperature of exemuta which are to be retained should be about 100° F. It is necessary in infinity to press the buttocks together for half an hour afterward to prevent the expulsion of the injection.

Hypodermic Medication.—This is not as often used in young children as it should be, and is of the greatest service even in infancy. The use of morphin hypodermically in convalsions, of morphin and stropes to cholera infantum, of strychom, complor, cufficin, episcolum, or digitalis in circulatory failure, may be cited as examples.

Hypodermoelysis.—This is a therapeutic measure of much value especially in infants when great less of fluid has been customed, as, for instance, in severe diarrhea, or when fluid given by the mouth cannot be retained as in pyloric stenesses. It is at times useful in guess of minimum when the times are dry, shriveled and wasted.

The solution employed is a normal saline (.9 per cent) prepared with sterile or preferably freshly distilled water. The amount injected may be from 100 to 120 c.c. (three or four onness) to an infant of fits or six peands, and 150 to 250 c.c. (five to eight ounces) to one of nine or ten pounds. It is given once or twice in twenty-four linurs. The fluid is contained in an inverted wash bottle suspended a foot or two above the patient and flows through a rubber take and an ordinary hypodermic needle. The injection may be made into the subsutancess tions of any of the large arcolar planes of the body, the back between the scapular, or the abdomen being preferred. The apparatus should be sterilized before using. Before injecting, the solution should be warmed to body temperature and keps warm during injection by wrapping the bottle in flancasi. It requires from one-half hour to two hours for the solution is flow into the tissues. Absorption usually takes place in four to sax bours. Metabolism experiments have shown that a considerable part not only of

the water but of the salt so given is retained for two or three days by these whose tissues need it must. Healthy infants usually eliminate it very quickly, getting rid of most of it within trendy-four hours. A slight rise of temperature, rarely over 101.5°, occurs a few hours after the injection in about half the cases. Hypodermoolysis may often be repeated with advantage for several days.

Massage. In older children massage is useful for the same conditions as these for which it is employed in adults; the most important are accusa, general malnutrition and chronic constipation. It is necessary that in the beginning only the mildest movements of massage should be employed, and these but for a short time.

In infancy massage has a limited application and it is doubtful whether it really does more than can be accomplished by the general friction of the body. This rubbing, either with the hare hand or with come latter, or with some form of fat, is useful in malautration, in rickets, and in wasting discuss when the circulation is feeble and the massular tone low. Come butter is clearly and has a pleasant ofor, and is, we think, quite as valuable as the more commonly employed cod-liver sil, which is exceedingly disagreeable. The manufaces should be given daily after the morning bath, before an open fire. The rubbing should be continued for lifteen to twenty minutes.

Anesthetics.—As a general anosthetic for routine use, other is to be recommended for children. Its disadvantages can largely be overcome by proper administration; in point of safety it is immeasurably superior to chloroform for the very young. The administration of other to young children may be advantageously preceded by a few whiffs of nitrous oxid or othyl chlorid; both, however, are to be used with caution in infants. Ether should be given alardy, well dilated with air, and if used in this way its unpleasant features may be obviously. This can best be accomplished by the use of some special form of tohalor. Ether should not be selected as the anosthetic for patients suffering from rephritis, branchitis, pasumonia, plearisy, or any other disease attended by obstructed respiration.

The dangers from obloroform are greatest when it is given too rapidly or in too concentrated a form. Both are exceedingly likely to occur when it is administered to a struggling shild. The greatest care and judgment should be exercised at such times, or disastrous consequences may follow. To produce and maintain the effect desired with the minimum amount of obloroform should always be the aim. All mostheties, but especially chloroform, are dangerous in children with the so-called lymphatic distincts. For the removal of toosits or adenable, chloroform should not be employed.

Nitrous oxid, while very medal in older children as in adults for

momentary operations, is not well beene by infants. It produces so early and so deep asphysia that its prolonged use may be fraught with serious danger.

Transfusion.—Two methods of performing transfusion are in use:
The first, the end-to-end anastomesis introduced by Carrel, is somewhat
difficult of technic and requires a skidled surgeon; second, the springs
method popularized by Lindomann, which is much simpler and can be
done by one of very moderate experience. In this the blood is drawn from
the vein of the donor, perfembly a member of the family, into a paraffiacoated glass syrings and immediately injected into the vein of the child,
usually the external jugular, but any available superficial vein may be
chosen. In most cases it can be done without any dissection. As the
hierd must be rapidly passed from one person to another before engulation takes place, at benef one assistant and the use of four or five syringes
are needed. The amount of blood usually injected into infants is from
two to see ounces.

The indications for transfusion are: first, in any acute hemorrhage, especially the homorrhages of the newly born, where it is usually a specific remely and acts at once; secondly, in loss of blood during or after operations. In some types of sepecially severe secondary anemia it is of tensfit. In the slowly developing ausmins, whether from disease of the blood-forming organs or as an accompaniment of malnutrition or maristras, it is of very transient lensfit.

PART II

SECTION I

DISEASES OF THE NEWLY BORN

CHAPTER I

ASPHYXIA

The lungs in the full-term fetus are of uniform dark red color, and show very distinctly upon their surface the lobular divisions. They are firm and solid and readily sink in water. The connective tissue is very abundant, and forms distinct fibrous septa, which stretch through the lungs in every direction.

Inflation of the lungs begins with the first cry attered by the infant as it is born into the world. The parts first expanded are the anterior borders of the langs, then the upper lobes, and finally the lower lobes posteriorly. The superficial labules are nearly always expanded before those in the interior of the lung. The inflation is cometimes irregular, because of the accumulation of mucus in some of the brouchial tubes. The right lung is frequently stated to be expanded earlier than the left. Although this is often the case, there is no uniformity in this respect. The important point to be remembered is, that the parts last inflated are the posterior portions of the lower lobes. The expansion of the lungs is a gradual process, and in healthy infants it is probably not complete for two or three days. In delicate children it may be postponed for several days, or even weeks. The above statements are based upon post mortem observations upon infants dying from various causes during the first weeks. It has often been a matter of great surprise to find at autopsy on an infant two or three days old, that less than one-half of the lung tions was expanded, although the child had breathed well and shown no signs of atelectasis. Under normal conditions at full term inflation of the lungs takes place very readily, but not so readily in premature or delicate infants, on account of the feebleness of the respiratory muscles. The longer it is postponed after birth the more

difficult does it become, on account of the changes which occur in the soliapsed air cosicles. The condition of the child is after may be described as one of fetal aprea, its oxygen being received and its curbon discoid discharged through the placents, which is essentially the organ of respiration at this period. This condition is interrupted by cutting off the supply of oxygen and the accountlation of carbon dioxid in the blood. Which of these is the important factor in inducing pulmonary respiration has been much detected; but the best experimental evidence seems to show that it is the latter which stimulates the respiratory context.

Under the term "asphyxia" may be included all cases in which primary respiration is not epontaneously established with sufficient force to maintain life. Usually there is no attempt at pulmonary respiration until after the birth of the child, but it may occur in afevo or at any stage of parturation. Asphyxia may be of intra-uterine or extra-uterine origin.

Existogy.—1. Intra-Uterine Asphysia.—The nuternal causes include any disturbance of the placental circulation during labor—anything which prolongs the second stage, or, family, the death of the mother. The causes relating to the child are pressure upon the cord, multiple winding of the cord about the neck, early separation of the placenta, and pressure upon the brain. If the respiratory stimulus comes before the tirth of the child, the effort at respiration may cause the entrance into the mouth and air passages of amnuatic fluid, muons, blood, meconsum, etc.

2. Extra-Uleriae Asphysia.—This condition is a much less common one. It arises from causes quite apart from those above mentioned, and depends upon multi-mations or intra-uterine disease of the tegans of respiration, circulation, or of the brain. It may be secondary to an injury of any of those organs received during participing. It is also seen in premature infants, where it depends upon the feeble development of the nerve centers and respiratory muscles and upon the soft, yielding clast walls.

Lettous.—In infants dying of intra-atterior asphyxia there are senthe usual changes found in death from sufficiation, together with the effects of attempts at breathing in stero. There is general congestion of all the viscera, particularly of the brain and its maninges, the liver, and the lungs. They may show small, punctate homorrhages, and occasionally large extravasations. Blood or bloody scrum may be found in any of the scrous cavities. The right heart is overdistended with dark, soft clots, and the blood generally is more fluid than normal. The lungs may contain no air, but more frequently there are small, arattered areas in which lobular inflation has taken place. If the child has lived several boars there are larger areas of expanded lung, especially in the upper labor, and these may even be emphysematous, if artificial inflation has been employed. In the mouth, nose, larynx, and even as far as the finest brenchi, there may be found aspirated materials—amniotic fluid, blood, macus, or mecanism. In extra-uterine asphysis there may be organic charges in the viscora—malformations of the lungs or the heart, intrauterine presuments or pleuritic effusion, malformation of the disphragm and sometimes of the brain.

Symptoms.—Under normal conditions the newly-born infant begins at once to scream and to use his timbs, the purplish color of the skin giving place in a few moments to a roay pink. In the first degree of asphysia—asphysia livida—the child is deeply symmed. Either no attempt whatever is made at respiration, or it is superficial and repeated only at long intervals. The pulse is slow, full, and strong. The vessels of the cord are distended. Muscular tone is preserved, and also cutameous irritability, so that with the application of almost any kind of external stimulus respiration is excited and the symptoms disappear.

In the second degree-aspliaria pullida-the picture is quite a different one. The face is pale and deathfiles, though the lips may still be blue. The heart's action is weak, and by palpation can rarely be felt at all. By assembation the sounds are feeble, irregular, and usually slow. The cord is saft, pale, and flaccid, and its vessels nearly empty. The sphincters are related and meconium osces from the anus. There is entire less of tone in the voluntary muscles, so that the extremities and entire body arem perfectly limp. Cutaneous sensibility is abelished. The extremities are often cold. There may occur a few short, convulsive contractions of the respiratory muscles, but these are without effect and soon cease. Unless such cases receive the most prompt and efficient treatment, the beart's action becomes more and more feeble until it comes and death occurs. Other cases are partly resuscitated and may survive for a few hours or days, when they gradually sink, respiration becoming more and there feeled in spile of all effects to maintain it. Between these two extremes all degrees of severity are seen.

In extra-uterine asphyxia there may be some attempts at roluntary respiration continuing for several hours, sometimes for a day or two, but this may be inadequate to scattain life.

Diagnosis.—Almost the only condition with which asphyxia is likely to be confounded is corebral compression from a meningeal homorrhage. The difficulties in the case are much increased by the fact that the two conditions are not infrequently associated. It may then be impossible to tell that in addition to asphyxia, intracranial hemorrhage is present. If the homorrhage is extensive and the asphyxia only moderate, a diagnosis is possible in most of the cases. In hemorrhage there is often a history of under compression during delivery—sometimes the use of fercept. The fourtanel is hislging; there is come, and there may be paralysis. The respiratory marmar may be quite strong for several hours, but it gradually fails as the child becomes completely countess. Anemia resulting from a large isomerrhage, like that due to rupture of the cord, may simulate the severe form of sushyxia.

Prognosis.—This depends upon the grade of asphysia and the treatment employed. There is but little tendency to spontaneous recovery in any form. In the milder cases recovery is almost invariable with any intelligent treatment. In the severest cases the entrome is always doubtful, although by persistent effort many infants that are apparently hopeless may be saved. In a prognosis as to the ultimate result, the frequent complication of asphysia with meningeal hemorrhage should always be kept in mind. Apart from this complication it is doubtful whether asphysia has anothing to do with the production of islicey.

Treatment,—In every case the first step is to clear the mouth and pharyinx of mucus by means of the finger covered with absorbent cotton. In the milder forms respiration is usually excited either by spanking the child or the alternate use of hot and cold boths. If the hot both is employed, the water should be from 104" to 108" F. and always tosted by a thermometer. After a moment the shild should be dipped into very cold water, or the body may be douched with it. In the livid cases relief is aften afforded by allowing the cord to blood for a few moments before ligation. The loss of half an sonce of blood is ordinarily sufficient. Simply swinging the child in the air is a powerful stimulus to respiration. The above means will suffice in the great majority of cases. In the more severe forms, however, these are inadequate. There is no response whatever to external stimulation, either by heat or mechanical irritation. In these cases two methods of resuscitation may be employed: artificial respiration and direct inflation of the lungs.

One of the most widely employed methods of inducing artificial respiration is that of Schultze. The infant is grasped by both axillae in such a way that the thumbs of the physician rest upon the anterior surface of the chest, the index flagers in the exillae, and the remaining flagers extending across the back. The chibl is thus suspended at arm's length between the knees of the physician, the feet downward and the face anterior. The body is now awang forward and upward, until the physician's arms are nearly horizontal. This produces the impiratory effort. When this point is reached, an arrest in the swinging causes flexion of the trunk, the head now being directed downward, the lower extremities fall toward the physician until the whole weight of the body rests upon the thumbs. In this way expiration is produced. Luck cautions against the employment of this method if the heart's action is very feeble, as it may cause the beart to stop altogether. This method should

be used with care and skill; clumsy and too forcible manipulation has resulted in many serious injuries to the viscera and fractures of ribs or clavicles.

A method introduced by Dew has been extensively employed in New York. The infant is grasped in such a way that the neck rests between the thumb and foredager of the left hand, the head being allowed to fall far backward, the upper portion of the back resting upon the palm of the hand; with the right hand the knees are grasped between the thumb and fingers, the thighs resting against the palm of the hand. Inspiration is produced by depressing the pelvis and lower extremities, thus causing the abdominal organs to drug upon the disphragm, and at the same time gently hending the dorsal region of the spine lackward. In expiration the movement is reversed, the head being brought forward and flexed upon the thorax, while at the same time the thighs are flexed so as to bring them against the abdomen. The body is thus alternately folded upon itself and unfolded as the movements are carried on. If there is much mucus in the mouth, the movement of expiration should first be made with the body completely inverted. This method is simple, efficient, and much less fatiguing then that of Schultze when it is to be maintained for a long time. It is also of great advantage in that it can be carried on while the child is in the hot bath, one of the greatest objections to the method of Schultze being the loss of animal heat incident to its use.

In all cases where artificial respiration is used the first movement should be that of expiration, to expel, so far as possible, nursus or other foreign substances from the air passages. The movements should be made from eight to twelve times a minute, and not too forcibly, the child being kept in the hot both between the movements, and as much as possible during them. As long as the heart bests respectation is possible, and the case should not be abandoned.

Direct inflation of the lungs by the month-to-month method should not be employed.

An ingenious apparatus for artificial inflation of the lungs has been devised by Carrel of the Rockefeller Institute, making use of Meltzer's method of the continuous insuffation of air. A flexible catheter containing a wire stylet is introduced into the largus. By means of a double bulb a continuous flow of air is maintained. A manometer measures the pressure employed and is a guide by which one is presented from using an excessive amount of force. When the pressure employed is normal the mercury in the descending and ascending arms of the curved tube stands at about the same level; if an excessive amount of pressure is used, the mercury will be forced up into the bulb. Although this has been very little employed in infants it has been extensively used in resuscitating

animals and seems to faitill all the indications better than any apparatus hitherte suggested. It is so simple of construction that it can easily be put together by any instrument maker.

The method introduced by Labords, of making rhythmical traction upon the tragge ten or twelve times a minute as a means of exciting respiration, a constimes very useful in conjunction with other methods. Faradization of the phrenic is of unforchted value, but somewhat difficult of application.

In cases of asphysia it is not enough to make the child ary. The deep responsions should be made to continue, for very often it happens that respectation is only partial, and that the child after six or eight hours lapses into its previous condition. All serons cases require close watching for the first twenty-four or thirty-six hours, as a repetition of the treatment is often necessary.

CHAPTER II

CONGENITAL ATKLECTARIS

This condition is one in which there is a persistence of the fetal state in the whole or in any part of the lung.

At lectusis is the pathological condition with which applying of the newly born is usually associated. In most of the cases the condition of at lectusis is completely overcome by the means employed in researchation; in some, however, these means are only partially successful, so that a portion of lung of suriable extent remains in the fetal condition. These are the circumstances in which most of the cases of at electasis arise. But there are others in which there is no history of early applying, where the primary respirations, although taking place spontaneously, have not been of sufficient force and depth to produce full pulmonary expansion. This namely occurs in feeble infants, or in those who are premature. The causes of congenital at electasis are therefore, in the main, those mentioned as producing applying.

Lestons.—In cases where the shild dies during the first few days the amount of expanded long is often small, frequently not more than one fourth of the pulmonary area. The expanded portion is usually the anterior borders of the upper lobes. This is often the sent of acute employeems. The rost of the long is still in the field state; it is of a brownish-red color, very viscular, does not crepitate, and shows the localiar outlines both on the surface and on scotion. With a little form the abelievatic lung may be completely inflated.

If children have fixed a longer time, nearly the whole of the upper lobes and the anterior portion of the lower lobes are usually well inflated. These portions are either normal or slightly emphysematous. The posterior portion of the upper lobes and the lower lobes are almost invariably the seat of the atelectasis. On the surface even these portions may present quite a large area of expanded vesicles, but the underlying portion may be solid to the touch, and crepitates but alightly. On section it is seen that only the most superficial part of the lung is inflated, while the interior of the lobe is unexpanded. Small hemorrhages are frequently seen beneath the pleurs.

It is usual for both lungs to be affected, and often, but by no means uniformly, to about the same degree. It is frequently a great surprise to discover that a child has fixed for some weeks without presenting any agas of cyamsis, although using not more than one-third of his pulmonary area. This variety of atelectasis closely resembles the hypostatic pneumonia of delicate infants, and very often the two conditions are associated. It may require the microscope to decide between them. If songenital atelectors has existed for a considerable time, there are usually found evidences of pneumonia. Inflation is not so easy as in recent cases, but with force the greater part of the lung can usually be expanded. The heart commonly shows the right nursele and ventricle to be distended with dark clots, and there is occasionally found a patent forumen ovale or some other form of concentral lesion. The liver and spleen are in most cases congested, and the spleen may be considerably enlarged. The mucous membrane of the stomach and intestines is sometimes deeply represted.

Symptoms.—In one group of cases the children are asphyxiated at birth, but the attempts at resuscitation have been only partially successful. Although the patients may live for a few days, there is symmons, which gradually deepens, and death takes place from asphyxia, exhaustion, or convulsions.

In a second group of cases the infants have been asphyxated at birth, and resuscitated perhaps with difficulty, but to all appearance completely. They do not thrive, however, remaining small and delicate, gaining very tettle or not at all in weight, and showing poor circulation, cold extremities, and occasionally subnormal temperature. It is characteristic of these cases that the cry is never load, strong, and lusty. Some of them will not cry at all. Such children may live several weeks. There may develop at any time, often quite suddenly and without assignable cause, attacks of cyanoses with prostration. Children may have several such attacks, which do not excite suspicion since they pass away quentamentaly. In other cases the symptoms are so severe that they may result fatally in a few hours, death being frequently preceded by consulsions. If ener-

getically treated the symptoms may pass away but, reappearing in a few hours, or again after a week or more, they gradually deepen in intensity until death accurs.

Two cases that came under our observation in the New York Infant Asylum illustrate this point: The infants were twins, but weeks old and delicate. Suddenly at night one child was taken with convulsions, became deeply evanceed, and died in two and a half hours. He had been suffering from a slight attack of indigestion for a week previous. The other twin had been apparently well on the previous day. Two hours after the death of the first child the second was taken with similar symptoms, dying in a few hours. At autopsy there was found very extensive atelectasis involving the posterior part of the upper and the greater part of both lower lobes. The lesions were almost identical in the two cases, In both, the slomach was greatly distended with food and gas. We have repeatedly seen the effect of overdistention of the stomach in producing eranesis in young children, and in this instance we believe if to have been the exciting cause of the final symptoms. It was subsequently learned that during the six weeks of observation the nurse had witnessed several slight attacks of cyanosis in one of the infants. It is of course possible that the atelectasts in these cases may have been in part at least acquired.

We have seen a number of cases, in which there was nothing whatever to attract attention to the lungs until the final attack of synnesis occurred. In not all of these cases is there a history of asplyxia at birth. Some are only puny, delicate or premature, exhibiting during the early weeks of hife all the signs of feeble vitality. The subsequent course is the same as in those in which there is early asphyxia. The duration of life in these cases depends chiefly upon the extent of the atelectasis.

It is not to be supposed that all rases of congonital atelectasis terminate fatally. Infants in whom there is every reason to believe that atelectasis exists, from the occasional attacks during the first few weeks of spanosis, feedle cry, poor circulation, etc., may under favorable conditions with improved matrition recover completely, even though no special treatment is directed to the lungs.

Diagnosis.—The physical signs are of much less value than the symptoms. It should be remembered that the principal seat of the disease is the lower lobes posteriorly. Percussion usually gives resonance over the entire chest, although this may be somewhat diminished posteriorly. There is not, however, so much change as one would expect to find, for the collapsed areas are surrounded by others which are overdistended, and there are in the midst of the collapsed parts, especially upon the surface, hobules which are inflated. If the two sides are involved to about the same degree, as is often the case, we can get us difference in the percussion note even the two imags, and the change from the normal may be so

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slight as not to be appreciable. Where only one lung is affected a difference can usually be made out. The respiratory marmor is rarely beometrial, but generally only feelds in its intensity, and rather ruder in quality than normal. The cardiac sounds may be transmitted with abnormal intensity. As in the case of percussion, if only one lung is affected, this is of some value in diagnosis, but it is not sufficiently marked to be readily recognized when both sides are involved. Occasionally piles are present.

Treatment.-In the newly-born child, whether asphyxiated or not, the physician should see to it that the infant not only cries, but does so loudly and strongly, and that this cry is repeated every day. If children do not cry naturally they must be made to do so by the alternate use of the hot and cold bath, as in cases of aspliyxia, or by mechanical means, like spanking. This should be repeated at least twice a day, and continued for from fifteen to thirty minutes. It may seem erucl but it is often the only means of saving life. Expansion of the lungs is much more easily induced during the first few days of life, becoming more and more difficult the langer it is delayed. Provided the condition is recognipel, treatment is fairly successful. In institutions where delicate infants spend most of the time in their cribs, atelectasis is likely to be found. An infant needs exercise, and this is often only to be obtained by taking the child from its crib several times a day, by general friction, massage, the stimulus of fresh air, etc. Nothing is more pertain to perpetrate atelectasis than to allow the infant a life of feeble vogetative existence. Food and feeding must be carefully attended to, but even these are of less importance than the maintenance of the animal heat. The temperature is often sulmormal, and should be closely watched. If there is difficulty in looping the child warm he should be rolled in cotton and surrounded by hot bottles, or kept in an incubator during the first few weeks. During attacks of crancels the same means are to be emplayed as in cases of aspleysia of the newly hom-cutaneous stimulation. and artificial respiration-the administration of drugs being of little or no value, but oxygen may be of assistance.

CHAPTER III

MUTERUS

SEVERAL varieties of ictores are not with in the newly born.

1. It is often seen in the various forms of pyogenic infection. In such cases the others is usually mild.

- 2. It may be due to congenital malformations of the bile-ducts.
- 3. It may depend upon interstitial hepatitis.
- The most frequent of all varieties is the so-called idispathic interes, sometimes spoken of as physiological interes.

In the case included under the first head interns is a minor symptom. The other varieties are sufficiently important to require separate consideration.

Malformations of the Bile-ducts.—The common hile-duct is the most frequently affected. There may be alresia at the point where it opens into the intestine, the duct may be represented by a filtrons cord, or it may be absent altogether. In many cases this is the only lesion; so others it is associated with an impervisus hepatic or cystic duct; in still others, the common duct is normal, but the cystic or hepatic ducts are impervious.

At autopsy all the organs are usually found intensely jaundiced, particularly the liver. In recent cases this is very much swellen, but presents no marked organic changes. In cases which have lasted several months there is commonly found chronic interstitial hepatitis, sometimes to a very marked degree. This was present in nine of the fifty cases collected by Thomson. The gall-bladder is usually small, and often radimentary. In cases of atreets of the common duct it may be greatly distensed.

The condition of the bile-ducts is ascribed to an error in development and subsequent catarrhal inflammation. There does not seem to be sufficient evidence to prove that hereditary syphilis is an etiological factor of much importance. This was present in but five of Thomson's cases.

Sprephous.—The most striking symptom is joundice, which is usually noticed a day or two after forth, and steadily increases until it becomes intense. The other symptoms of obstructive joundice are present. The urine is colored a dark brown or bronze by bile pigment, the stools are white, and bile pigment is absent or present only in traces, except in cases where malformation is limited to the cystic duct. The liver as a rule is much enlarged. The sphere is often swellen. Hemorrhages beneath the skin or from any of the nuncous membranes are quits common. Vomiting is usually absent. In most cases there is progressive wasting, and death from inantition within the first few works. Of Thomson's fifty cases, nine lived less than a month, and only eighteen over four months. Lotte has reported a case of a child living eight months with an impervious bepatic duct. A frequent cause of death in the more rapid cases is convulsions.

A small percentage of these cases are amenable to surgical treatment.

Interstitial Hepatitis.—There is seen in newly-born children a form
of acterns which resembles the foregoing in many particulars, but which

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tary end in recovery. In three such cases which have terminated fatally we have found the lesions of a general interstitial hepatists, presumably of syphilitic origin. It is not certain that syphilis is always the cause of this condition, for the clinical history in some of them gives no evidence of this disease. While not a common condition we believe it to be more frequent than congenital malformations of the bile-ducts with which it is aften confounded.

The symptoms and course may be illustrated by the following cases: A full-term, well-developed child of eight pounds' weight became juundiced on the second day. By the fifth day the jaundice was intense; stools, pule yellow, and urine deeply bile-stained. Examination at three weeks showed both liver and spleen much enlarged. The jaundice was very marked for over a month; it was nearly two months before it faded entirely. The notrition of the child was a matter of much difficulty for accoral weeks. The enlargement of the spleen and liver like the jaundice disappeared very gradually. There was no other evidence of syphilis in this patient nor in the two other children of the family, and no history of this disease could be obtained in the parents. Yet the improvement which began with the use of mercurial inunctions strongly suggested a syphilitic lesion.

In another case, the symptoms and course of which were almost identical, the stools, though nearly whole, never failed to give the renction for bile. A previous child in this family had died three years before at the age of six weeks with persistent jaundice, which had been diagnucticated congenital malformation of the bile-duct. There was no history of syphilis; but the increasial inunctions seemed equally efficacious as in the first case rited.

Not much need be added to the symptoms described. In our cases which recovered and in the fatal cases there was no fever and no ascites ; but there was much tympanites. The application of the Wassermann test will no doubt aid in cleaning up the chology of these cases. Other evidences of syphilis should always be carefully sought, but in all the cases we have seen, even those ending fatally and with syphilitic lenious at autopsy, clinical evidence of syphilis during life was wanting. A careful trial of antisyphilitic treatment should, therefore, be made in every case of protracted jaundice in a newly-born child. One should not be too ready to make the diagnosis of malformation of the bile-ducts and regard the case as hopeless. Nor does the fact that the child recovers without antisyphilitic treatment exclude syphilis as the cause, for one of Still's cases recovered from the jaundice and died at the age of nineteen months, the autopsy showing lesions evidently syphilitic.

Physiological or Idiopathic Interus. —In 200 consecutive births at the Storne Hospital for Women interus was noted in 700 cones. In 28 it was intense, in 212 it was mild. According to the statistics of various lyingun hospitals of Germany, it was found in from 40 to 80 per cent of all infants. In the 300 cases just referred to, acterns was noticed on the first day in 4, on the second day in 19, on the third day in 72, on the fourth day in 86, on the 25th day in 67, and on or after the sixth day in 44. From the second to the fifth day is therefore the usual period for its appearance.

It usually increases in seventy for one or two days and then slowly disappears. The average duration in the mild cases is three or four days; in those of moderate seventy about a week; in the most severe cases it lasts many weeks. Interns mountaining is regularly found in premature and very delicate infants. The course with them is also more prolonged and the leturus usually more severe.

The seterus is first noticed in the skin of the face and chest, then in the conjunctious, then in the extremities. The skin varies in solar from a pale to an interest yellow. The urine in most cases is normal. It sometimes is of a light brown color, and only in the most seture cases does it contain tile pigment in appreciable amount. The stools are unchanged, the normal yellow evacuations occurring in the interic as early as in those not affected.

According to some observers, in infants who are interior the initial loss in weight is greater and the subsequent gain slower than in other children. This is not been suit by the Sloane statistics. The proportion of interior infants who did well, moderately and bully, was practically the same as of the other children in the institution not suffering from interior leterus occurs with equal frequency in both sexes. There are usually no other symptoms than interior, and the condition is practically never serious, though a prolonged course may accusion some consern. With the premature and poorly normaled it is the general condition and not the interior that is dangerous. Very rarely a severe and fatal form of interior is seen affecting successively external infants in a family. Death takes place in a few days without sufficient pathological studence to explain the nation.

In journiced infants who have died from accident or other causes the skin and almost all the internal organs are found interio. There is staining of the internal cost of the arteries, the endocardium, the pericardium and the pericardial fluid. The subentaneous connective tissue is yellow; the spleen and kidneys only in the severe cases. The liver is slightly discolored. The bile ducts are normal. There may be small bemorrlages, openially on the errors surfaces. The brain and need are rarely, and the condeceptual fluid never, bile stained.

Few subjects have given rise to wider speculation than this form of interest. It has been held that it is due to obstruction from thick hile in ICTERUS 81

the bile ducts, to extensive blood changes, and to various other causes.

The researches of Yilpo have shown that in the last mouth of fetal life there is an increased production of bile pigment. Even at birth the blood contains three or four times the amount that the maternal blood contains. After birth there is a very rapid increase in the pigment content of the blood which usually lasts from three days to a week; exceptionally for several weeks. At the end of a few days the blood may contain twenty times as much pigment as at birth. Usually after a few days the pegment in the blood diminishes, rapidly at first, then more slowly. The normal is not reached for several weeks. All infants show this increased amount of hile pigment. Those that subsequently develop interns have at birth a greater bilimition centent in the blood and also produce more pigment subsequently. Icterus is noticeable when the blood contains, roughly, 125 mgm, of pagment to each 100 oc. of blood. The cause of the increased production of pigment is not entirely clear. There is not yet sufficient evidence that it is due to the destruction of the red blood cells. Only a slight amount of the pigment can be excreted by the kidney. It is most probable that the liver at this early stage of development is smallle to remove the excess of pigment from the blood. This accumulates and when it reaches a certain concentration in the blood, rauses appreciable seterus. With the cessution of the blood destruction and the increase in functional activity of the liver, the pigment as removed. The difference in the leteric and the non-icteric infant is one only of degree. It is quite proper in each circumstances that the condition should be spoken of as "physiological Libertal, by

Diagnosis of the Different Varieties of Irterus.—The diagnosis of physiological leterus is to be made from malformations of the bile-ducts, and interstitial hepatitis. In early sepsis it is doubtful if the infection produces the icterus. It is more likely that the two conditions are associated. In the later sepsis joundice may be due to an hepatic lesion, usually multiple absences. In malformations of the tile-ducts the icterus is usually more intense and appears almost immediately after hirth; bile is absent from the stools; the interus is persistent, and the symptoms go progressively from bad to worse, always ending fatally. In interstitial hepatitis the interus develops at about the same time as but is generally more marked than, in the physiological variety. Both liver and spleen are usually enlarged. The stools may be light colored, but still give a faint hile reaction.

Physiological interus requires no treatment.

CHAPTER IV

THE ACUTE INFECTIONS OF THE NEWLY BORN

Ir is possible for the newly-born infant to suffer from almost any of the common infectious diseases. Smallpax probably has been most frequently observed. Barely pertussis, influence, meades, typhoid fever, malaria, and purumenta have occurred in the first days of life. As the mothers in many instances were suffering from the diseases during or just prior to delivery, the infants appear to have been infected before birth through the circulation of the mother. In other cases, especially in pneumonia, influence, and gastro-enteritis, infection may take place seen after birth. The symptoms of these diseases in the newly burn differ very little from those securring in any other young infant. In addition to the diseases mentioned, there are other forms of infection which belong especially—some of them exclusively—to the newly born.

THE ACUTE PYOGENIC DISEASES.

Under this best are grouped various infectious of the newly born, due to the entrance of the common progenic bacteria. They have been designated as pure perol fever of the child, also as pyrious or supplicable, or simply as sepain of the newly born. A variety of pathological and clinical conditions are met with. In some cases there is only a localized external inflammation, often terminating in abscess formation; sometimes one or more of the internal organs is affected; occasionally a general blood infection—a true septicemia—is seen without any noteworthy local lesion; finally, there are the cases attended by the production of multiple abscesses in the sistera, joints, or cellular tissue—a true pyrmin. Formerly infections of this class were very common, especially in large lying-in hospitals; but, owing to the general adoption of the methods of asspite midwifery, they have steadily diminished.

Etiology.—The source of infection of the child may be the vaginal secretion of the mother or, in very rare cases, the mother's milk. Although it has been shown that in a great proportion of the cases the milk of a woman suffering from mostitis or from septicemia contains pyogenic perms, still the taking of these into the stomach is not likely to infect the infant. More frequently the child is infected by the nurse in the process of dressing the cord, bothing, or cleaning the mouth or eyes, possibly after having attended to the needs of a aeptic mother or snether

child. Infection may be carried by the physician, by instruments, or by the dressings of the cord. Infection may occur through any wound or abrusion of the skin.

Infection through the unhilicus may take place either before or after the separation of the cord. The infection may take place through the ambilicus, yet this may give no external evidence of disease, although the unhilicul vessele inside the body may contain pas. From this focus of infection may arise peritonitis, meningitis, or other inflammations. Entering through the mouth, factoria may lead to infectious processes in the throat, the stomach or intestines, and rapidly produce death; or the alimentary tract may be the focus from which infection of distant parts may arise.

The microorganisms chiefly concerned in these infections are the common progenic bacteria, staphylococcus progenes aureus and the strep-tococcus. The next in importance is the generoccus, the rôle of which, especially in cases accompanied by joint suppuration, has only recently been appreciated. Presumesoccus infections occussomally complicate the others mentioned. While streptococcus infections are in general more serious than those due to the staphylococcus, some of the most severe ones net with helong to the latter class.

Clinical Varieties.—Omphalitis.—In this variety there is inflammation of the ambilious, and cellulitis of the abdominal wall in the immediate neighborhood. This results in the formation of an umbilical phlegmon. It may terminate in resolution, in abscess, or in gaugetes. The usual termination is in abscess. These abscesses may be small and superficial, or they may be more deeply seated between the abdominal tunides and the peritoneum. Omphalitis usually begins in the second or third week of life, before the umbilious has cicatrized. The process may result in erysipelatous inflammation and it may spread to the peritoneum.

Inflammation of the Umbilical Vessels,—This is one of the most frequent primary processes in pyemic infection. The umbilical arteries are more frequently involved than the twin. According to Runge, inflammation of the vessels is always preceded by inflammation of the connective tissue which surrounds them, as the poison is taken up by the lymphatics and not by the blood-ressels. Omphabitis is frequently present, but in some cases the umbilious shows nothing absormal.

In arteritis the vessels may be involved to any degree; semetimes only a short distance from the abdominal wall, nametimes quite to the liver. They contain pas, and often explic thrombs. Succedar dilatation is frequently present at several points. Pus cometimes exacles from the ambilical stamp on pressure. The other bestons accompanying arteritis are those of pyrmic infection, more or less widely distributed. There are frequently persent peritoritis, suppuration of the joints, erysipelas, multiple absorous of the cellular tissue, sometimes suppurative purotitis. Attlectusis is commun. Puromonia was found in twenty-two of Runge's fifty-fire cases.

In cases of phichitis, the untilical vein is usually involved for its entire length from the abdominal wall to the liver. This may lead to an acute interstitial hepatitis going on to suppuration, or to phichitis of the portal vein and come of its brunches. In either case there is more or less pureachymatous hepatitis, and often multiple abscesses of the liver, most of the patients being joundiesd. Peritoritis also is a frequent complication.

Peritametic.—This is one of the most frequent pathological processes in pyemic infection, and is very often the cause of death. It is generally associated with untidical arteritis, and often with erysipelas. In a considerable number of cases it is the most important boson found. It may be localized or general. Localized peritonitis is generally in the neighborhood of the untidicus or of the liver. It may result in adhesions, or in the formation of peritoneal abscesses. More frequently the peritonitis is general and resembles the septic peritonitis of adults. There is a great compouring of fibrin coating the intestines and other tracers and the inner surface of the abdominal wall, causing adhesions between the abdominal contents. Collections of sero-pas are found in the pelvis and in various pockets formed by the adhesions. Sometimes blood is present in the expediction.

The special symptoms which indicate peritonitis are comiting, abdominal tenderness and distention, and protrusson of the umbilieus. The abdominal colorgement is chiefly from gas, but may be partly from fluid. There are present thoracic respiration, deepl decabitus, fixion of the thighs and fluation of all the numbers, the child bying perfectly quiet. The temperature is usually but not necessarily high. Marked laucocytosis is generally present.

Paramonist.—The most common form seen is pleuropaeumenia. There is an abundant exhibite of grayish-yellow fibrin covering the long. Occasionally collections of passure found in the sacs formed by the adhesions. Seems effusions are rare. The pulmonary lesion consists usually in a bronchopneumonia, with consolidation of larger or smaller areas in the longs—more often in the upper than in the lower lobes. It is not uncommon for minute absences to be found in the long at various points. There is a purclent broachitis of the larger and smaller takes.

The symptoms are obscure and often indefinite. The only characteristic ones are cyanous and rapid respiration, with recession of the chest walls on inspiration. The physical signs are inconstant and uncertain

Presentation often can not be diagnosticated during life. In most of the fatal cases of pyogenic infertion, whatever its type, there is found some involvement of the lungs. The changes are most extensive in cases in which the serous membranes are involved.

Perfordiffic is rare and usually associated with pleurisy. Endocarditis is very rare. Hirst has, however, reported a case.

Meningitis.—When maningitis is present it is often associated with peritonitis or with pleurisy. The lesions are those of acute purulent maningitis with a copious exudation, numerimes associated with meningeal bemorrhages, or with acute encephalitis and the production of multiple minute abscesses in the cortex. The local symptoms are often not marked, and are constitutes very obscure. The most characteristic are stuper, dilated pupils, opisthetonus, bulging fontanel, general rigidity, convolcious, and occasionally localized paralyses. The temperature is generally high. A positive diagnosis can generally be made by lumbar puncture, by which means also the exciting cause of the meningitis can usually be determined.

Gastro-exteritis.—Diarrhen is a frequent symptom in all septic cases, constipation being early present. In many instances comiting is a prominent symptom. In a small proportion of cases the most important local besions are in the intestines, generally in the nature of a superficial external inflammation.

Stometitis.—Infections of the oral mucous membranes are not infrequent but sometimes very severe. They may be due to the streptococcus, staphylococcus nurcus or the genecoccus. An occasional complication of oral infections is absense of the paretial.

Outcompelitis.—Allard has reported a series of cases in which, after the general and local symptoms of progenic infection had existed for some time, suppuration occurred over various lones, especially the hunerus, tihin metatarsal bones, sarrum, etc. Trephining revealed the lesions of osteomychitis. The abscesses notally made their appearance between the fourth and the sixth week. The most rapid case terminated latally on the fourteenth day, and note lasted more than two and a half months.

Joint Supparation.—In certain pyrmic cases, and in some in which there are no other symptoms, acute supparation in the joints occurs. This may come on very scutely in the first or second week, or more slowly as late as the second or third month. In the nexts cases it is exceptional to have but one joint intulved; frequently there are four or fire. The small joints are rather oftener affected than the large once, but almost any articulation in the body may be involved. With multiple joint supparation there are present the general symptoms of pyrmis—high temperature, marked prestration, wasting, and usually secondary

viscoral inflammations develop. In those which occur late, or which stendop more alsoly, fewer points are involved often but a single one, the februlo symptoms are less marked or wanting. In our own expension, the organism most frequently found in these cases is the generoccus; next to this in importance is the streptococcus and oversionally the pneuroccoccus is found. The joint being is usually a superficial one, the loans generally escaping. The generoccus cases probably occur most frequently as a complication of ophthalmia; but we have seen several in which uplethalmin was not present and where the point of entry could not be determined.

Many of the abscore supposed to be in the joints are shown at operation to be at the applyaes; from this source the joints may be involved secondarily. A point to be remembered in the diagnosis of those joint inflammations is their resemblance to the applyaits of hereditary appliilis and other symptoms of that disease should be bulsed for. The confusion is increased by the fact that in application are abscored may follow as a consequence of a secondary infection.

. Clockers is the Cellular Tissue.—These are quite frequent, and may occur with supparation in the joints or the internal organs, or they may exist as the only besten. They are nearly always multiple and may be found in almost any location. They vary in size from one containing a few drops to half an ounce of pas. They are due to the introduction of pyogenic germs, usually staphylococci. Their course is benign, and they require no treatment except incline and classifiness. When there is a disposition to their continued formation, the skin should be washed with an antiseptic solution and varcines should be administered.

Ergelyrias.-This is seen especially during the first two weeks of life and usually starts from the umbilious or some abrasion of the skin, anot frequently about the genitals or the scalp. When originating at the unhificus it is generally complicated by other lesions, such as peritenitis and umbilical philobitis. If it starts from any other part of the body it may be uncomplicated. Erysipelas beginning at the umbiliess gives rise to an area of induration and a circumscribed epithema. At first it may recemble a simple cellulitie; but the steadily increasing area of elevated induration and reduces soon indicates the nature of the inflammation: From whatever point starting, the crysipolatous inflammation, owing to the feeble resistance of the tiones, in most cases spreads widels. The entire abdomen, chest, and back may be involved, and it may even spread to the extremities. Nearly the whole trunk may be affected in four or fire days. It usually involves only the skin and experient cellular tissue; but it may involve the deeper arcolar planeand terminate in diffuse suppuration, or even in gangrens,

The constitutional symptoms are morner great prestration, continu-

postly high temperature—102° to 105° F.—rapid wasting, and frequently vomiting, discribes, or convulsions are present. The discase is always serious, and usually fatal. It is often complicated by breachopseumonta, General edema of the affected parts may person for a few weeks after the inflammation subsides.

Distribution of the Lesions.—The frequency of the deferent vocavral lesions in eighty-even autopsies published by Bednar was as follows: Peritoritis in twenty-nine, presumania in afteen, plearny in ter, meningitis in some, meningral bemorrhage in orght, exceptalitis in eight, cerebral hemorrhage in four, exterocolitis in five, pericarditis in four. In thirty-one cases there was ambilical arteritis, and in nine cases umbilical philobitis. There was one case each of pulmonary bemorrhage, pleural hemorrhage, acute bydrocophalus, nente broachitis, and suppuration in the cellular tissue. Range's later observations of thirty-six cases showed umbilical arteritis in thirty, ambilical philobits in three, and normal umbilicus in three. He found presumania in twenty-two of fifty-five cases. Other lesions frequently associated are atchectasis, aweiling and softening of the speem, cloudy assetting of the liver and kidneys, occasionally with foci of suppuration in these organs.

General Symptoms.—These may begin at may time during the first ten days—very rarely after the twelfth day. Fever is an exceedingly variable symptom-it may be very high; it may be almost absent; occasionally there is subnormal temperature. The course of the temperature is very irregular. Wasting is constant and quite rapid. It depends upon the inability to take and digest food, upon the indestinal complications, and upon infection. In quite a number of cases wasting is almost the only symptom. Interns is common; in many of the worst cases it is intense. It is not with where the liver is the sext of an acute parenchymatous or acute suppurative inflatomation, and in many other cases where it depends apparently upon the blood changes. Hemorrhages tre common, and may be the direct cause of douth. They may come from the ambilious, the intestine, or almost any muous membrans. They are sometimes subcutaneous, causing a general hemorrhagic eruption. Xerous symptoms are generally present, and are sometimes marked. They are restlessness, rolling of the head, a constant whining cry, faritchings of the muscles of the extremities or face, stiffening of the body, more rarely general convulsions. Late in the disease, didness and stuper are present. The pulse is rapid and weak and the respirations are often irregular, even when there is no cerebral complication. Diarrice is frequent; the stools are green, brown, sometimes black from the presence of blood, and are often very fool. Ventiting is less outsmon. In addition to these there are symptoms due to the various forms of local inflammation-peritoritis, resolugitis, presumenta, ercolpèlas

sub-utaneous supparation and gangrene, these all being found in varying degrees and in various combinations.

Prophylaxis.—Programs infection of the shild, like pureperal fever in the mother, may be considered a preventable disease. Its occurrence is assually due to a failure to carry out proper rules regarding classification and asspois in connection with delivery. The statistics of the Moscow Lying-in Asylum, published by Miller in 1888, show that previous to the general introduction of asoptic methods, from six to eight per cent of all infants born in the institution died from some variety of infection, In twenty three hundred successors labors at the Sleane Hospital for Women, covering about eight years, not a single marked case sociared. From these figures it will be evident that in the vast majority of cases the occurrence of a case of infection of a serious nature is the fault of the physician or nurse in attendance.

The unhilicus should be cleaned and treated like any other fresh wound. Dry dressing should invariably be employed, and sterilized game or salicylated cotton in preference to household linen. If supports on occurs at the time the cord separates, the parts should be cleaned daily with a bichlorid solution, and a wet dressing of the same applied. The ligatures and everything which comes in contact with the umbilical wound should be sterilized. Careful attention should be given to the mouth, pentials, and all the uncoentimeous surfaces, to prevent excentions and intertripy. Finally, every septic case occurring in an institution should be innecessately isolated. A nurse in charge of a septic mother should not have the care of the infant.

Prognosis.—Pyogenic infections in the newly horn, even in their mildest forms, are senses, and in their most severe forms almost always fatal. Very few cases recover in which experpelas or any important visceral inflammation is present. The resistance of these patients is so feeble that the tendency of every inflammation is to spread, until they die from exhauction. Only putsents with localized inflammations, such as those of joints, skin, etc., are likely to get well.

Treatment.—This practically resolves itself into the treatment of individual symptoms as they arise. Wherever suppuration occurs, external abscesses should be evacuated and treated antisoptically. For the local inflammations of the lungs, peritoneum, and brain, little or nothing can be done in the way of direct treatment. Such inflammations are to be prevented, but can seldom be cured. The general indications are to look closely to the child's general nutrition by careful attention to all details of nursing and feeding, using stimulants whenever required by the condition of the carculation. For a local application in erusipelas, nothing in our experience has proven better than inhthyol oinfment, ten to twentyfive per cent strength. It should be applied daily, spread upon muslin, which is then covered by guita-percha tissue to prevent drying. Vaccines have been much employed in erysapelas: our own experience, however, estincides with that of most observers that there is very little evidence that they have any value.

OPHTHALMIA

Ophthalmix of the newly born is to be classed among the pyogenic decases. It usually consists in a purplent conjunctivitis. In the more severe cases there may be ulceration of the corner, and even perforation into the anterior chamber of the eye.

The highly infectious nature of this ophthalmia is established. In the most sense cases the microorganism generally found has been the generoccus, but in the milder forms the generoccus may be absent, and any of the common pyogenic germs may be found. In the generoccus cases the infection occurs during labor, from the accretions of the mother, from the examining fingers of the physician, or from instruments; or after birth from infected cloths and other materials which come in contact with the eye. Healthy lockin produce only a entarrhal inflammation. The infection occurring after birth may take place at any time. That due to generoccus infection from the mother is generally manifested on the third day, and is often virulent from the cutset.

The symptoms are, swelling of the lids, chemosis, copious pursions discharge, sometimes bemeerhages from the lids, ulceration, and there may even be alonghing of the cornea. The course of the discuss depends upon the cause and upon the treatment employed. In the cases not due to the genococcus the course is generally benign, and with ordinary cleanliness usually ends in recovery without any permanent damage to the right. The genococcus cases, unless energetically treated from the outset, are very frequently followed by permanent loss of viscos. The best statistics upon the causes of blindness in adults show that from twenty-five to thirty per cent of such cases are due to ophthalmin in the newly born. This disease is occasionally complicated by other symptoms of genococcus infection of a pyemic nature. Many cases followed by acute articular symptoms have been observed.

Prophylaxis is of the utmost importance. Credit's statistics show that in 1874 the frequency of splithalmin in his lying-in hospital was 15.6 per cent. In the three years ending 1883, among 1,100 newly-born children, only one or two cases occurred. The method of prophylaxis which he adopted consists in dropping into the eyes of every child, one mediately after birth, one to two drops of a two-per-cent solution of nitrate of silver. The general adoption of Credit's method, or of more similar means of disinfection, has resulted in a very great diminuation in

the frequency of epithalmin throughout the world. These prophylactic means should be obligatory as all institutions, and should be used in all cases in private practice wherever there is any possible suspicion of the existence of generation. In all other cases the eyes should be carefully cleaned with a ten-per-cent solution of argyrol. The use before delivery of an antisoptic raginal datable is theoretically indicated, but peactically it has been found to be inadequate for the prevention of the disease.

Treatment.- Everything which comes in contact with the eyes should he carefully disinfected. All cloths, rotten, etc., used for cleaning should be immediately turned. The strictest anticeptic pregations about he invoted on to present the spread of the infection by nurses. In institutions containing infants, severe cases of ophthalmia should always be isolated. The most important thing is to keep the eyes clean. In severe cases they must be cleaned overy twenty minutes, night and day. It may be done by irrigation, or by using an eye-dropper with a bollous tip, inserted alternately at the inner and the other angle of the eye, and the fluid injected with force sufficient to empty thoroughly the conjunctival suc. Either a saturated solution of loric acid, or a 1-4,000 solution of highlarid, may be used in this way. Once or twice in twenty-four hours two or three drops of a ten-percent solution of argorol should be used in each eye after cleaning with sterile water. Next to these measures is the use of cold. It may be applied as ice compresses which are changed every minute or two from a block of ice to the eye. These may be continued one-fourth of the time in the milder cases; in the severe ones almost constantly. When the cornea is involved the pupil should be diluted by atropin. If only one eye is affected the sound one should be protected by covering it with a compress kept wet with an antiscutic solution.

TETANUS

Tetaums is an acute infectious disease characterized by tonic muscular spann, which increases in seserity by purcayons occurring at longer or aborter intervals. It may be limited to the muscles of the jaw (trianna), or may affect all the muscles of the trunk, extremities, and neck.

The germ of setamus usually game access to the body of the infant through the umbilical wound. It exists in the soil, and the disease prevails endemically in sertain localities. It is common in certain parts of Long Island and New Jersey. Among the negroes in some parts of the South it has for many years occurred with great frequency. It is stated that on one of the islands of the Hebrides every fourth or lifth child dies of tetanus. In a single house in Copenhagen eighteen cases were observed. Tetanus presents no essential lesions. It is rare except where dirt and filth prevail; but these alone are not sufficient to produce the discuse. It is rare in the tenements of New York.

Symptoms. - These, as a rule, begin on the fifth or sixth day, or at the time of the separation of the cord. The first symptoms may not appear until the tenth or twelfth day, but rarely later than this. Generally the first thing noticed is difficulty in morning, which on examination is found to be due to rigidity of the jaws (trismus). Nursing may be impossible on this around. The muscles of the jaw feel hard, the lips pout, and all the muscles of the face seem firm. Soon a slight stiffening of the body occurs, the child straightening the back as he lies upon the lap and continuing rigid for a moment or two. In the interval he as at first completely relaxed. These purcovans soon increase in frequency until they may come on every few minutes, being excited by any morement of the body. The relaxation is then only partial, and the neck and extremities and sometimes nearly the whole body may become rigid and stiff as a piers of wood. The arms are extended, the thursdu adducted. and the hands clenched. The thighs and legs are extended, and no motion is possible at the hip or knee. The jams can be separated slightly or not at all. The firm contractions of the facial anocles give a psculiar expression to the features. There is a low, whining cry. Swallowing is difficult, semetimes impossible. The pulse is rapid and seen becomes weak. The temperature at first is normal, but in the most armie cases rises rapidly to 104" or even 106" F.; in the milder cases it does not go above 101° F.

Death may be due to exhaustion, to fixation of the respiratory muscles, or to space of the larger. In the less severe cases all the symptoms are mider, and there may be intervals in which the rigidity is scarcely noticeable, so that respiration and deglutition may be carried on for some time. In cases which terminate in recovery the temperature is but slightly elevated. The tonic contractions gradually become less severe, and the paraxysms less frequent. The shibling usually suffer for several weeks from the general symptoms of malnutrition, which are proportionate to the severity of the attack. Of sighty-eight fatal cases which are reported by Stadtfeldt all but five died between the ages of six and ten days. The duration of the disease in the fatal cases is seldent more than forty-eight hours, often less than twenty-four hours; in those terminating in recovery, between one and three weeks.

Progress.—For discuss of infrary are more fatal than tetanos-Where it prevails endemically it is regarded by the faity as so uniformly fatal that usually no physician is called. Scattered through medical littrature are quite a large number of isolated cases in which receively has becaused. At the present time the proportion of fatal ones is probably between ninety and nonety-five per cent. Sporadio cases more frequently recover than these occurring in districts where the disease is endemic. The later the development of the symptoms, the slower their course, and the lower the temperature, the more likely is the case to recover.

Prophylaxis.—A proper understanding of the nature of the disease has brought with it the means of rational prevention. The first essential is obstetrical cleanliness, which must include sensors, hands, dressings, ligatures—in short, everything which comes in contact with the numbilical wound. In districts where tetanus is endemic, thorough aseptic treatment of the umbilious should be insisted upon, both at the first dressing and later, particularly at the time of the separation of the cord-

Treatment.-All drugs whose physiological action is that of motor depressants of the spinal cord have a certain amount of value in totanus. The most important ones are chloral and the bromble. Nearly all the reported cures have been by one of these drugs or a combination of them. The mistake usually made is in using too small doses. Enough to produce the physiological effects of the drug must be given. The initial dose should not be large, but it should be repeated until the full effects are obtained. Chloral, however, has been the drug most generally relied upon. An hourly dose of one or two grains is usually required. If no effect is visible in ten or twelve hours the dose may be further increased, as the patient is in much greater danger from the disease than he can possibly be from the drug. Chloral may be given by the mouth or by the rectum, but must always be well diluted. The single case of necessry which we have seen was one treated by the bromid of potassium. This infant took eight grains every two hours for three days, afterward smaller doess. The child must at all times be kept as quart as possible, without unnecessary handling or bathing. If sursing or feeding by the mouth is impossible, because the jaws cannot be separated, the shild may be fed by a tube passed through the name. This is greatly to be preferred to rectal alimentation. Drugs may be administered in the same way.

The Antidoxia Preofescal.—This is of especial value in prophylaxis. To be efficient as a curative measure it must be used early, for after the disease has developed it is very doubtful whether much can be accomplished by its use; but as it is harmless, it should be employed and given, both intraspinally and intravenously.

EPIDEMIC REMOGLOBINURIA (Winciel's Disease)

The essential features of this disease are hemoglobinaria with interest and cranosis, this combination giving the skin a deeply broazed lear (maintife troacie). It is a rare disease, but has generally occurred epotemically in institutions. It is usually fatal. It is, without doubt, infectious, but its cause has not been discovered. Although generally called by the name of Winckel, who in 1879 made a report upon an epotemic of twenty-three cases, the disease was quite well described by Charrin in 1873, with a report of fourteen cases, and observed by Bigstow, in Boston, in 1875. All the cases included in Winckel's report occurred in one institution, affecting one-fourth of the children born during the period.

There is cyanosis, with a more or less intense icterus of the skin and internal organs. The umbilical ressels are usually normal. The kidneys are swollen, show small bemorrhages into their substance, and under the microscope the straight tubes are seen to be filled with crystals of hemoglobin, but contain no blood-cells. The bladder frequently contains brownish, smoky urine. The sphen is swollen and filled with blood pigment, which is diffused throughout the cells of the pulp, and free in the blood-vessels. Punctate hemorrhages are seen in most of the other viscora.

The symptoms usually begin from the fourth to the eighth day after birth, and are foliminating in character, seldom lasting more than two days. There are rapid pulse and respiration, general restlesoness, protration, cyanosis, and general icterus, which may be intense. The temperature is normal or slightly elevated. There is rapid asthenia, often terminating in come or convolutions. The urine is passed frequently, in small quantities. It is of a smoky reloc, and contains beneglisted in considerable quantity, renal opethelium, and semetimes granular costs and blood-cells, but does not contain bile pigment. Albumin is sometimes present, but not in large quantity.

Treatment is of little avail, since all severe cases are fatal.

PATTY DEGENERATION OF THE NEWLY BORN (Bubbs Durans)

A disease has been described by the author whose name it bears, the essential nature and causation of which are unknown. It occurs as isolated cases, and is characterized by inflammatory changes leading to fatty degeneration in the viscera, especially the heart, liver, and kidneys; it seldem lasts more than two weeks, and is almost invariably fatal. Many of the lesions are similar to the cedimary post mortan changes, and when found they should not be interpreted as pathological unless the autopsy is made within twelve hours after death.

The clinical features of this disease, as described, resemble those of progenic infection; and since the observations were made before modern methods of bacteriological study, it is highly probable that Buhl's discuss is merely a form of pyogenic infection in the newly born.

PEMPHIGES NEONATORUM-BULLOUS IMPETIGO

Pemplogus is a term which designates a lesion rather than a disease. By it is meant an eruption of bullar occurring usually upon a red base, the contents being in most cases clear acroin. A condition somewhat rescribing pemplogus sometimes follows the use in the newly bern of too hat baths. Again, bullar are seen as one of the lesions of congenital syphilis; they are then usually present at birth or appear soon after. They are used frequently seen upon the palms and soles. Infants so affected are generally in wretched condition, and seen dis-

The only condition to which the term pemphigus accounterum should be applied is quite different from both the preceding, and it has nothing in common with the pemphigus of later life. A better name is bullous impetigo, for its identity with impetigo contagious seen in older patients is now generally admitted. The disease is infectious, somewhat contagious, and occasionally occurs in small epidemies in institutions. He append in communities has been traced to midwises. The only important difference between this disease and the common impetigo contagious seen in older children, is its severity and its association with visceral infectious. Most patients with bullous impetigo are delicate, neglected, and living in dirty surroundings; but not all are. We have seen it in rebost infants who had received fairly good care.

The greater number of cases studied thus far have shown the presence in the blobs of the staphylococcus progenes amens; less frequently the streptococcus has been the cause. The stophylococcus aureus was found in several typical cases occurring in our own hospital service. In one of these which came to autopsy, a general staphylococcus septicemia was present.

The clinical picture presented by pemphigus assuntarious is so striking that it can erarcely be mistaken. The symptoms begin in most cases between the fourth and teath day of life. The bulks first appearing are scattered and often ask larger than one-fourth or one-half inch in diameter. They may be seen upon any part of the body, but are especially frequent about the face, hands, and other exposed parts. They rupture or dry and form crusts without suppuration. The small bulks may gradually increase in size or several may coulosse until they cover an area two or there inches in diameter. As the discuss progresses, new bulks may appear over almost any part of the body. The skin is at first slightly reddened, then an excitation of serum severs beneath the epi-

dermis which lossens and slides upon the true skin. After rupture of the large bullse, the opidermis at the margin forms a thin filmy border or langs in shreds usely described. The base of the large trackles is a most bright-red surface. When many have formed the appearance closely resembles that seen after an extensive burn.

The course of the local symptoms is at first alon; then the bullar may spread with great rapidity and death occur in from twinty-four to fortyright hours. In less setere cases the course is more protouped, the blebs are smaller, and recovery may take place.

The constitutional symptoms are at first wanting, but increase with the number and extent of the bullse. There may be a slight rac of temperature or it may be subnormal. There is progressive realises and



Pro 8.—Pawermone Nanasatanes: Symptome began on 13th day; health on 10th day of atthemic beingerature estudients. The dark areas in the picture are entirely decaded of epidermic; they were formed by the enablements of large ballian.

great depression, much like that following a laten, and death occurs from exhaustion or from some visceral inflammation such is parameter or meningitis.

A disease very closely allied to pemphigus accountering in its etiology and clinical symptoms is derectific exfoliction (Ritter). This also is due to infection with staphylococci which are found not only in the skin but often in the blood and viscers. The entancous leasers when typical may readily be differentiated from pemphagus, but there are many instances in which the lesions of both conditions may be present at the same time. A further similarity is found in the fact that in institutional epidemics both forms of disease may occur side by side, pemphigus in some infants, dermatitis exfedintiva in others. There is at first a redness and slight swelling of the skin which usually occurs first around the month, spreading upon the face, and then appears upon the extremities and trank. The skin seems as if maccrated and eventually exfedintes in large masses, leaving exposed the red corions from which some serous explation takes place but there is no accumular

tion of fluid beneath the epidermis before the separation of the overlying skin. The area denuded may be very great, sometimes fully half the hody being thus expected. Death often results in two or three days. In other cases, it is delayed for a week or ten days. In some, recovery occurs. The general symptoms are similar to those seen in pumphagus.

It is important to distinguish pemphigus asonatorum from congenital syphilis. In syphilitic cases, the liver and spleen are usually markedly enlarged, and other characteristic changes may be present in the nail muons membranes, or elsewhere.

Treatment is of little avail in the most severe cases, when the bullar cover a considerable part of the surface of the body. The bullar should be opered and drained, and the surfaces drossed with gause covered with a two-per-cent continent of white precipitate. There is little danger of increasial postening. When dressings are changed the skin should be sponged with a bicklorid solution, 1-5,000 strength, or a one-per-cent solution of ichthyol or permanganate of points. On account of the contagious nature of the disease tases occurring in institutions should be isolated.

CHAPTER V

HEMORRHAGES

Historimators are quite frequent during the first days of life, and are important not only from the fact that they are often the cause of death, but, when the brain is the seat, from their remote effects. There are several conditions in the newly born which predispose to bleeding the extreme delicacy of the blood-sessels, and the great changes taking place in the blood itself and in the circulation in the transition from intra-uterine to extra-uterine life. Hemorrhages may complicate many of the discuss of the early days of life, such as syphilis or sepsis, or they may exit, alone.

The cases may be divided into two groups: (1) Traumatic or Accidental Hemorrhages, which depend upon causes connected with delivery; (2) Spontaneous Hemorrhages, or The Hemorrhagic Disease of the Newly Born.

TRAUMATIC OR ACCIDENTAL HEMORRHAGES

These are mainly due to pressure in natural labor, or to means emyed in artificial delivery, but some of them may possibly result from injuries received before both. They are more frequent in large children, in difficult labors, and where from any cause the body of the child has been subjected to undue pressure.

Hematoma of the Sternomastoid.—Hematoms of the sternomastoid muscle leads to the formation of a tumor in the belly of the nuscle. It is a rather rare condition, usually noticed in the second or third week of life, and it disappears spontaneously, rarely causing any permanent deformity. The tumor varies from three quarters of an inch to one inch and a half in length, being about the size and shape of a pigeon's teg. It is movable, almost cartilaginous to the touch, and sometimes slightly tender. The situation of the tumor is usually about the center of the muscle. There is no discoloration of the skim.

In about two-thirds of the cases it occurs after breach pessentations. It is much more frequent upon the right than upon the left side. In twenty-seven cases collected by Hensels the right side was involved in twenty-one and the left in only six cases. The explanation of this differrnce is to be found in the obstetrical position. Rarely, both sides may be involved. The head is usually slightly inclined toward the shoulder. of the affected side and rotated toward the opposite side. The swelling slowly diminishes in size, and in most cases by the end of the third month has nearly or quite disappeared. Occasionally a slight terticollisremains for a longer time, but in the majority of cases the recovery is perfect. Hematoma of the sternomastool is due to the twisting of the head during parturition. It is not an evidence of the employment of any improper force in delivery. The twisting of the head produces laceration of some of the blood-vessels of the muscle, and in some cases there is doubtless rupture of some of the fibers of the muscle itself. Following this there occurs a certain amount of inflammation of the muscle and its sheath. The tumor is due partly to blood-extravasation and partly to inflammatory products. In one or two recent cases in which the sheath of the muscle has been opened it has been found filled. with blood.

The condition requires no treatment. Operative interference is positively contra-indicated.

Cephalhematoma.—This is a tumor containing blood, situated upon the head, usually over one parietal bone, and tending to spontaneous disappearance by absorption. The source of the blood is the suprare of the small ressels of the perioranium.

Elicitory.—Cephalhematoms is sometimes due to a distinct traumatism like the application of forceps or to some other injury during labor. In the majority of cases, however, there is no evidence of such injury. Besides the conditions predisposing to all bemorrhages, there is the increased pressure in the blood-vessels of the load during delivery, especially when labor is predouged or difficult; there may be change in the base, such as an imported development of the external table; and, builty, there may be changes in the blood itself. Cophalisemateria is a comparatively rare condition; it was present according to the statio-ties of the Sionne Hospital for Women, in 20 of 1,300 consecutive births, or 1,5 per cent. The condition is more common after first or difficult labors, and in vertex presentations; occurring twice as often in make as in females, probably from the greater use of the head.

Lerious.—In the 26 Shane cases, the situation was over the right purietal hone in 12 power the left in 2; over both parietals in 4; over the scripital in 2. The location of the timor seems to have a very close relation to the position of the head in the pelvis. In 8 of the right-sided



Pas 4.—Torral Currentermental Jahor between days old.

cases the head was in the left occipito-anterior position. Of the cases with occipital trumos, both were breach presentations. Of the 16 cases with a single tomor the labor was natural in 10, tediens in 4, and in 2 for esps were used. Of the 4 double cases, 2 were forceps deliveries.

In rare cases triple tumors are not with, one over each panetal and one over the orcipital hone (Fig. 9). The attachment of the periodeum along the antures usually limits the immor to the surface of one bane. It never extends across the sutures or over the fortanel. In

cases where there is a more definite injury, such as that from forceps, the
tunior may be present over any one of the cramial bones, but more frequently over the purietal. The seat of the bemorrhage is between the
periodicum and the cramium. The scalp shows punctate bemorrhages and
sometimes infiltration with blood. In recent cases the blood is dual; later
at is congulated. The amount of extracasated blood is usually from half
an ounce to an ounce. The cases following natural definers are generally
amounplicated. The traumatic cases may be complicated by extracsations between the bone and the dura (internal cephalhematoms), or
by meningeal or correlatal hemorrhages. If there is a wound, infection
may be followed by purulent meningitis and even by cerebral absence

Symptoms.—The turner is usually noticed from the first to the fourth day after birth, appearing as a elight prominence in one of the positions mentioned. Gradually increasing in size, it attains its

maximum at the end of a few days, and then slowly diminishes. In em and shape the usual turnor may be compared to the bowl of a tablespeed. In marked cases it may be one-third the size of the child's head. To the touch it is soft, elastic, fluctuating, and irreducible. It does not increase with the cry or cough. There is no extra heat and no signs of inflammation. Usually the tursor does not pulsate, although in rare instances pulsating cephalhematomata have been seen. Very soon the lumor is surrounded by a marginal ridge. At first this is apparently from congulation of blood, but later it may be beay. The promocut ridge with the soft center gives a semulion somewhat like that of a depressed fracture. Sometimes on pressure there is obtained a sort of purchment-crackling. This is generally found as the swelling is subsiding, and is sometimes clearly due to the formation of minute Seny plates upon the inner surface of the periosteum. It may be found when there is nothing but thin congula to explain it. In certain cases following severe traumation, cephalbenateon may be complicated with wounds of the scalp, fracture of the skull, and even lacerations of the dura mater or the brain. In such cases the tumor may become inflamed, but in the spontaneous cases this is extremely rape. The usual signs of aboves develop, which may spen externally or lorrow. Fortunately this termination is seldom even.

As a rule, without any interference the uncomplicated cases go on in recovery. The complete disappearance of the tumor may be expected us from six weeks to three mouths, depending on its size: but a hard, uneven elevation may remain at its site for a longer time. The runs due to severe transmitten are more serious, the gravity depending not upon the orphalhematons but upon the complicating belons.

Dispussis.—Cephalhematoms may be confiniteld with exceptable le.

This, however, occurs along the line of the satures or at the fontanels, apartially reducible, pressure causes cerebral symptoms, and frequently the tomor increases with respiratory movements. Caput succedancem often appears in the same place as a cephalhematema and at the same time, but this is an elematous, not a fluctuating tumor, and begins to disappear by the second or third day. From a depressed fracture of the shall, it is differentiated by the fact that in rephalhematoms there is a tumor and not a depression; the prominent margin which is raised above the contour of the skall is not ossess and the skall can be felt at the bottom of the center of the tumor.

Treatment.—The freatment in the uncomplicated cases is simply protective, all such cases tending to spontaneous recovery. No local or general treatment to promote absorption is required. The child about be so placed and so handled that no injury may be done to the affected part. Compresses are unnecessary. If complications exist, such as in-

jury to the bones, dura, or brain, they are to be treated in accordance with general surgical principles. Operative interference is called for only when supportation has recurred, or when there are brain symptoms which point to the existence of internal as well as external rephalhemations.

Visceral Remarrhages.—While these are most frequent in large children and following difficult labors, they may occur in small children and where the labor has been easy and normal—their occurrence here being due to the feeble resistance of the blood-ressels. From one hundred and thirty autopoies upon still-form children or those dying soon after birth. Spencer concludes that intracranial bemorrhages are more frequent in head-forceps than in breech cases, and more frequent in breech than in natural vertex deliveries. Other visceral hemorrhages are much more frequent in breech cases,

Not all visceral hemorrhages are to be classed as tranmatic. They are often seen with the spentaneous hemorrhages from the skin or muons membranes. When, however, they are single, they seem to be of tranmatic rather than of pathological origin.

These are discussed in the chapter devoted to Birth Paralyses. Barely there may be large bemorrhages into the lung. Here the blood fills the air vesicles and the small bronchi, and congula may be found even in the larger brenchi. A large part of a lobe or an entire lobe may be involved. On section the condition resembles atelectasis, and it may give the physical signs of consolidation.

The abdominal viscera suffer more than those of the thorax because less protected against pressure. Small bencorrhages are not uncommon upon the surface of any of the viscera excered by peritoneum. Intraperitoneal hemorrhages are rare, but may be very extensine, amounting to six or eight ounces. Sometimes no ruptured vessel can be found. The hemorrhage may be primarily in the peritoneal cavity, or it may result from rupture of one of the riscera, especially the suprarenal capsule. It may be large enough to produce death from loss of blood.

Small surface benerrhages of the liver are not infrequent. Occasionally one of considerable one occurs separating the personnel covering and forming a timeor generally upon the superior surface. Such laceration may be produced during labor, and a slow accumulation of blood may take place beneath the capcule, death resulting from rupture into the peritoneal cavity. Laceration of the capcule of the liver in a still-born infant has been reported. Of the large bemorrhages, those into the suprarenal capcules are perhaps the most frequent. The capsule may be distended to nearly the size of an orange, the kidney being surrounded by a mass of blood-clots. Bised may be extravasated into

the retrajeratoneal connective tissue and rupture may take place into the peritoneal cavity.

Except in the intracranial variety, viscoral hemorrhages cause few symptoms, and in the great majority of cases the diagnosis is not made. Intrapulmonary hemorrhages have given rule to the signs of consolidation of the lung and even to hemophysis. The abdominal hemorrhages are the most obscure. There may be a general abdominal distention with the usual symptoms of loss of blood, or there may be a circumscribed swelling. In many cases nothing is noticed until rupture of a subperitousal hemorrhage takes place into the general peritoncal cavity, when there may be sudden collapse and death.

The visceral hemorrhages are not amenable to treatment. The prognosis depends upon the size and position of the homorrhage. In the cases of abdominal hemorrhage the diagnosis is extremely obscure and is rarely made during life.

SPONTANEOUS HEMORRHAGES...THE HEMORRHAGIC DISEASE OF THE NEWLY BORN

A disposition to bleeding is seen with many diseases of the first few days of life, especially those of an infectious character like syphilis and pyends. With most of these, however, the hemorrhages are small and the condition may be compared to the homorrhagic tendency seen in certain forms of infection of later life, such as measles, smallpex, and malignant endscarditis. There is, however, a class of cases in which the hemorrhages are not associated with any other known process, and inwhich the escape of blood from the small blood-vessels is the chief or essential symptom. In these cases the bleeding is much more extensive than in the others mentioned. These hemorrhages are characterized by the fact that they are spontaneous in origin, having no connection with delivery, they are multiple in location, they tend to cease sponianestely after quite a limited time, but they are often greatly influenced. by treatment. They are most often from the mucous membranes of the storaich and intestines, or from the mubilious or beneath the skin, but they may be from almost any uncons surface or into any organ of the body.

Etiology.—These hemorrhages are not sommon, and are met with more aften in institutions than in private practice. In 5,245 hirths in the Beston Lying-in Asylum, Townsend reports 32 cases of hemorrhage, or 0.6 per cent. In the Lying-in Asylum of Prague, Ritter observed 190 cases in 13,000 births, or 1.4 per sent. In the Founding Asylum of Prague, Epstein reports hemorrhages in 8 per cent of 240

infants.

The condition is not a manifestation of hemsphilia, Only 12 of And Meeders whose histories were collected by Grandidier had a hissary of hemorrhage at the time of the failing off of the curt, and symptoms very rarely appeared before the and of the first year. Hemorrhages in the newly been are only slightly more frequent in males, while in hemophilia they prodominate 13 to 1. The hemorrhagic disease of the newly born is self-limited, and runs a definite course to recovery or death. The tendency to bleed does not extend beyond a few weeks, and often lasts but a few days. Circumcision has been done within a few dury after the ossistion of the Lemerbures without any unusual blooding. In a case under our observation with the most extensive subcutangous honorrhages we have ever seen, all tendency to blood had evased before the separation of the cord, although there had previously been bleeling at the navel. The bleeling occurs with about equal frequency in tooble and in well-nourished infants. Syphilis is associated in but a small proportion of the cases. On the other hand of 132 cases of congenital symbilis observed by Mracek, only 14 per cent suffered from hemorrhages.

An association with sepsis has sometimes been noted. Of the \$1 cases of served by Epstein not less than 29, and of the 190 cases of Bitter, 24 were associated with sepsis. During one year of our service at the Nursery and Child's Hospital there were 8 marked cases of hemorrhage in about 225 deliveries. While more cases of sepsis occurred among the children during that year than usual, it was striking that not one of these hemorrhagic cases gave any evidence of sepsis, and that none of the septic cases had bleeding. Yet the circumstances in which these hemorrhages sometimes occur point strongly to an infectious origin. The results, often remarkable, following the injection of human blood serum indicate that the coestial cause, in the largest number of cases, is a lark of some substance in the blood essential to congulation. Sufficient studies have not yet less made to establish the precise nature of these blood changes. The results of treatment would seem to show that the cause of these humorrhages is not always the same.

While the hemorrhages are not traumatic, bleeding is exceedingly prome to occur in the skin over pressure points such as the back, the olbors, the occiput, and the sacrum. It is also common from the manuse membranes which are the sent of pulledogical processes, especially from the eyes, the nose, and the genitals.

Lesians.—In very many of the cases the autopoy shows nothing except the hemorrhages in the various satuations and the blanching of the organs due to the loss of blood. The hemorrhages of the brain are usually maningeal and diffuse. They are considered more at length in the chapter upon Borth Paralyses. The pulmonary hemorrhages are nonally small and unimportant, and large hemorrhages into the plears or pericardium are very rare. The stomach and intestines may contain considerable blood nariously disorganized in the different parts of the rainl, and there may be evelymoses of the mucous membrans. In addition, ulvers may be found in the stomach and duodenum. In twentyfour autopoles upon cases with Lemorrhage from the stomach and intertime collected by Dusser, alcore were found in the stemach in zine cases, and in the intestines in four. These ulcers are multiple, small, and usually superficial, but may extend to the nesentar cost and may even perforate. The intestinal alcers are found only in the decelerant and rescaled those of the stemach. The cause of these places is somewhat obscure; some of them are undoubtedly dependent upon bullano metery changes, probably of infectious origin; others have been compared to the peptic alcers of later life, and are attributed to through in the blood-ressels of the museus membrane. These alters are found in but a small proportion of the cases in which bleeding scenes from the alimentary tract, and they may be wanting even when it has been very profess. Small extraoreations may be seen upon the surface at a the substance of any of the abdominal organs. The changes found m the Mood have not been uniform.

Symptoms.—The conset is most frequently in the first week of life; very rarely after the twelfth day. The hemorrhages are usually nufniple. Their location in Ritter's 190 cases was as follows: Umbilious, 138 (umbilious alone, 97); intestines, 39; mostle 28; storach, 29; conjunctione, 30; ears, 9. In Townseni's 50 cases: Infestines, 30; stunach, 14; mostle, 14; nose, 12; umbilious, 18 (umbilious alone, 3); subcutangous eachymnose, 21; abrasion of skin, 1; meninger, 4; orphalhemitoms, 3; abdomes, 2; plears, lungs, and thyrms, 1 carls.

In many cases nothing is noticed until the hemorrhage begins. The first bleeding noticed may be from the stomach, indestines, or any of the musous surfaces, beneath the skin, or from the unfellows. The amount of bleed lost in most cases is not great, but there is a continuous coming. The total hemotrhage may be only a few drams or it may reach several atmost. The general condition is one of considerable prostration, often from the outset. In all cases there is rapid less of swight. The temperature may be high, low, or subnormal. A marked obviation of temperature may depend not upon the hemotrhage but upon associated conditions. In a large number of the cases there is discribed.

The duration of the disease in cases which recover is usually but one or two days. In fatal cases it is rarely more than three days, and often less than one. Death may result from the gradual failure of all the vital forces or from rapid loss of bland.

Umbilical Hewarrhear. - A slight being from the umbilines not in-

Irequently occurs when the ligature has been improperly applied. This is generally controlled by simple measures. Spontaneous hemorrhage is quite different. It occurs rather later than bleeding from the mucous membranes, usually occurring between the fourth and the seventh day. There may be bleeding into the cord as well as from its free extremity. A slight stain upon the dressing is usually the first note of warning, but in exceptional circumstances a gush of blood is the first symptom. The hemorrhage may be temporarily arrested by various means, but it shows a strong tendency to recur in spite of everything which is done. The usual duration is two or three days. It has been known, however, to persist for twelve or fourteen days, and it may be fatal in less than twenty-four hours from the time it is noticed.

Hemorrhaye from the Stomack and Intestines,-Bleeding occurs much less frequently from the stemach than from the intestines. The latter is called meless. Gastro-enteric hemorrhages begin, in the great majority of cases, during the first three days of life. The blood venited is usually in dark-brown masses, and not very abundant; more rarely it is bright red. The quantity varies from one dram to half an ounce. Yomiting is liable to be earlied by nursing. The blood discharged from the bowels is always dark colored, usually intimately mixed with the stool, very rarely in clots. If in doubt between blood and meconium, one should look for the corpuscles with the microscope. When this is not conclusive on account of the dissegnmention of the corpuselos, a chemical test for hemoglobin should be made. Concealed hemorrhage into the stomach may take place, which may even be sufficient to produce death, no blood being vamited or passed by the bowels. In such cases the autopsy may reveal quite a large quantity of blood both in the stomach and intestines.

Hemorrhage from the Mouth —The quantity of blood is rarely large; but it is here that it is often lirst seen. Its source may be the mucous numbrane of the mouth, pharyox, esophagus, stomach, or brought. It may be associated with ulceration of the hard palate, with thrush, or with fiscures of the lips.

Hemorrhages from the some are infrequent, and are more often due to syphilis than to other causes. These are rarely profuse, but are frequently repeated.

Subsultaneous Hesserhoges.—These often appear in places exposed to pressure, such as the socrum, heels, occiput, or back, but may occur anywhere. In some cases these hemorrhages are very extensive, as in one recently under observation, where nearly one-third of the thorax was covered. When they occur alone or form the principal lesion, the prognosis is favorable.

Herselaria.-The arms is not only stained with Mood, but some

times contains clots. This hemorrhage may have its origin in the bladder, urethra, or kidney. Blood coming from the kidney is sometimes due to the irritation of uric-arid infarctions, and may have nothing to do with the general hemorrhagic disease.

Henorrhage from the Conjunction.—The blood usually comes in drops from between the cyclids, chiefly from the turnal surface. It is

generally preceded by conjunctivitis.

Hemorrhage from the Fennile Genitals.—This not infrequently occurs without hemorrhages elsewhere, and under such circumstances is rarely serious. Cullingsworth collected thirty-two cases in children under six weeks of age—no case having resulted fatally. These are not to be regarded as cases of precocious menstruation.

Disgress.—This is generally easy, as the bemorrhages are usually multiple and some of them external. A slight bemorrhage from the intestine may be easily overlooked. Large bemorrhages into the internal organs also are obscure and not often recognized. Spurious bemorrhages from the stomach may occur, blood being remited which has been swallowed during birth or nursing. The source of bleeding may also be the mouth, nose, or pharynx, and sometimes blood is swallowed in large quantities and afterward vomited. These cavities should therefore always be examined, since local treatment may be efficacious. Syphilis should be suspected when the bleeding is cheely most.

Prognesis.—Before the introduction of treatment with human blood serum the hemorrhagic disease in the newly born had a very bad prognesis. Of 709 cases collected by Townsend, the martality was 79 per cent. No case should be looked upon as hopeless, for perfect recovery

has repeatedly taken place when it seemed impossible.

Treatment.—Local measures may be employed in all external bemore rhages with some prospect of benefit. The bleeding points may be touched with persulphate of iron or with abromic and fused upon a probe, or fresh human blood or human serum may be applied locally. These measures may be employed alone or in combination with pressure.

Although recoveries have been reported following the use of a great variety of remedies, it is by no means established that the result was the to the drugs employed. Many of the milder cases recover without any special treatment. On the whole, the medicinal treatment is very mostisfactory. Epinephran is of doubtful benefit. Geletin has had many advocates. It is used by subcutameous injection. A 5-to-10-per-cent solution which has been twice sterilized is employed, from 25 to 50 c. c. being administered two or three times daily. Calcium factate in some instances appears to exert a positive effect. It may be given in frequently repeated doses up to 20 or 30 grains a day.

The most efficient treatment is transfusion, first practiced by Carrel.

It should, if possible, he performed whenever the loss of blood has been great. From 90 to 150 e. c. may be given. This not only replaces blood lost had, in the vast majority of cases, stops further bleeding at once. Its action seems specific and the effects of transfesion are often truly marvelous. That the subentaneous or inframescular injection of human blood serum would control those hemorrhages was first shown by J. E. Walch. Almost equally efficacions is the injection of human blood in the same manner. Usually 30 to 40 rays, of blood or blood scrum is injected at one time, and this should be repeated every few hours, if blesding continues. For transfusion, only the blood of a pureat should be used without provious bemolytic tests; for subsutaneous use, blood fram any healthy person will amover as well. The subcutaneous injection of horse serum has a certain value in these cases and should be employed when it is impractical to obtain buman blood sorum. It is, however, distinctly inferior. In some instances thrombin, prepared according to the method of Rowell, has caused a resultion of the hemorrhaps. A small proportion of patients, however, are not improved by the measures mentioned, and in spite of them bleeding may continue. These suggest a different etiology of which we have as yet no clue. The general treatment should have relesence to maintaining the nutrition by careful feeding, judicious stambation, and attention to the circulation, the body temperature, and the general condition of the child.

CHAPTER VI

BIRTH PARALYSES

Burrar paralyses are chiefly due eather to pressure upon the child by the parts of the mother or to artificial means employed in delivery. They may be corebral, spinal, or peripheral.

Cerebral paralyses are in almost every instance due to meningeal bemorrhage, and accompanied by a certain amount of injury to the brain solutance. Very infrequently they depend upon cerebral hemor-

rhage, lawration of the brain, or pressure from a depressed fracture of Spinal paralysis are extremely rare, and only a few examples are on record. They are due to laceration of, or hymorrhage into, the cord of

its membranes. These lessons produce paraplegia, the exact distribution of which depends upon the point at which the cord is injured.

Peripheral paralyses usually affect the face or the upper extremity. Paralysis of the face is due in most cases to the application of forceps. Paralysis of the upper extremity is meet frequently of the "apper

arm type," and is known as the Duchenne-Erb paralysis. It usually follows extraction in breach presentations. Peripheral paralysis of the lower extremity is almost unknown.

CEREBRAL PARALYSIS

Cerebral paralysis is often used synonymously with meningeal homorphage. This besion is not infrequent, still is of great importance not only from its immediate effects, but because upon it depend many of the cerebral paralyses seen in later life. According to Cruseithier, at least one-third of the deaths of infants which occur during parturition are due to this cause.

Etiology.—The same predisposing courses court to the cases of meningest hemotringes as in others occurring at this time. A small number

of cases are associated with suphilis; others. with pyogenic infection. In a few cases there is a history of an injuryaveally a fall or liley apon the abdomes-during the last months of perguancy. Meningeal bemorrhage may occur as. one of the lesions in the hemorrhagic discuss of the newly bern. The tanet important causes. lowever, are connected with parturition. These lemorrhages are soon-(tally mechanical, and tre favored he overy. thing which increases or prolongs pressure upon



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the head. The conditions with which they are associated are tedious labor, breech presentations with difficulty in extracting the head, instrumental deliveries, and premature births. The majority occur in first-born children. In many of the cases there is also a hemorphage suiside the skull.

Lesions.—The hemorrhages may be large or small. If small, they are frequently multiple and are found scattered over the convexity. In such eigenmetances they are usually beneath the arachemid. Edema of the brain is often associated with them. It is doubtful if

very small bemorrhages that may cause little more than a discoloration of the meninges are sufficient to account for death. They are found so frequently when there have been no symptoms referable to the brain that it is a question if they are not quite a common sequel of labor. Larger isomorrhages may be at the base or at the convexity and either in the anterior or posterior part of the skull. When upon the convexity, the blood usually comes from the voins ascending from the middle corebral region to the lateral aspects of the superior longitodinal sinus. These are largrated by the over-lapping of the parietal hones. Convexity hemorrhages are rarely limited to one bemisphere, although the one side may be much more affected. It is usual for the blood to gravitate toward the base and become diffused. Nearly the entire surface of the beain may be covered. Hemorrhages are frequently found over the cerebellum and the occipital lobes of the cerebrum; these are usually due to rupture of the tentorism. While this may allow of some extravasation of blood above the tentorium, the entire extravasation is often beneath it. Rupture of the tentorium is usually due to marked lateral compression of the head, but may occur when the pressure is anteroposterior. It is apparent that hemorrhages may result very rarely from marked vences congestion. In this way is explained the hemorrhage which is occasionally found in the lateral ventricles alone. This comes from rapture of the straight sinus or of the great win of Galen. Hemorrhages between the dura and the skull may be said never to occur except when associated with fracture. If the child is still-born, or, if death has occurred on the first or second day, the blood is partly fluid and partly coagulated; later it is entirely coagulated and may have undergone partial absorption. The amount of extravasated blood varies between one dram and two ounces, the average amount being about one-half ounce. The blood extends into the fisages between the convolutions and sometimes into the ventricles along the choroid plexus, although this is rure. In large hemorrhages the brain substance is softened and in places may be quite disintegrated; but with small extraorusations these changes are very slight and hard to demonstrate to the naked eye. In cases which survive for two or three weeks there is usually a certain amount of moningitie. The later changes—those of arrested development of the cortex and cerebral sclerosis-will be considered in the chapter devoted to Cerebral Paralpost in the section on Diseases of the Nervous System. Hemserlages into the membranes of the upper part of the eard are found in a large proportion of the futal cases. Associated hemorrhages of the lungs and other organs are not uncommon.

Symptoms.—If the homorrhage is large, the child is usually stillborn, although the fetal movements may have been active up to the semmencement of labor. When the hemorrhage is not so large us to to immediately fatal, the child may show no symptoms except deliness or stupor, with feeble or irregular respiration, death following within the first twenty-four hours. A large proportion of the infants are born asphyxiated, and frequently they are remediated only after comolerable effort. They nurse feelily or not at all. Convulsions are common in cases which last for four or fire days, and more with bemorrhages at the convexity than with these at the base. Opisthonous is often present, also general rigidity of the extremities, clerching of the hands, and increased knee-jerks. Barely there is complete relaxation of all the muscles. Sometimes there are automatic movements. The respiration is usually disturbed; in most cases it is slow and irregular. The pulse is feeble and usually slow. The pupels are more frequently contracted than dilated, and there may be oscillation of the evelally. There may be a slight exoptabalmus. In large hemorrhages there is marked bulging of the fontanel, and often separation of the entures. If the hemorrhage covers one hemisabere, there is complete hemiplogia of the opposite side. Small localized cortical hemotrhages may couse paralysis of the face, arm, or leg, according to the position of the losion, or localized convulsions. In large hemorrhages at the base convulsions are rare, and death occurs early, usually in the first two days. In extensive cortical hemorrhages convulsions and rigidity of the extremities are frequent, and life may be perloaged indefinitely. There is usually no fever, but exceptionally the temperature mux be high.

The majority of the fatal cases die within the first four days. In those lasting a longer time the symptoms are tonic spaces of the trunk or of one or more of the extremities, with localized paralysis—monoplegia, diplegia, or bemiplegia, according to the lesion—and localized or general convulsions often continuing for two or three weeks and gradually subsiding. In the mildest cases nothing absormal may be noticed until the child is oblicoeigh to walk or talk. In these more severe there may be gradual and continuous improvement of the early symptoms, and the case may go on to apparent recovery, but availly there is some permanent damage to the bratu.

The main diagnostic symptoms in recent cases are: bulging fontanel, slow palse, stupor, rigidity, increased reflexes, convulsions, and paralysis, especially when localized, and episthetonias. These vary with the extent and situation of the lesion. Lumber puncture has very doubtful value.

Prognosis.—A large bemerriage at the base quickly causes death; if it is located at the convexity, although the child may survive, there is always serious damage to the brain. Even from small homorrhages some permanent injury usually results, though the extent of this may not be evident for years.

Treatment.-This is mainly prophylactic, the shief indication being to shorten tedious labors by the early use of the foresps. When the hemorrhage has been attributed to the foresps, the damage has probably been the result of the long-continued pressure before they were mod-Nothing can be done after delivery to limit the amount of the bencerhaps, except to keep the child as quiet as possible. The removal of the elot by surgical operation has been successfully accomplished by Cushing and others. With more accurate diagnosis there seems to be no reason why a certain number may not be saved. For the best results operation should be done as soon as possible. One great difficulty is that of early and accurate diagnosis. Paralysis whether localized or general is of greater value in diagnosis than are convulsions. The latter, however, are especially important when localized or continuous and threatening life. The operative risk, while considerable, is not to be measured against the permanent mental deficiency usually resulting in most of these children when nothing is done. Cases with similar symptoms are sometimes seen in which there is no extravasation of blood found at operation, but only intense congestion with an executive serous explate. In them also relief may follow operation: The hopeless outlook for such cases when not rehered, justifies the taking of great risks.

FACUAL PARALYSIS

The usual cause of facial paralysis is the use of the forego, but this does not explain all the cases. The chiefup of those in which the forego have not been used is still somewhat obscure. In peripheral facial policy the nerve is pressed upon, either near its exit from the stylumateoid formmen, or where it crosses the ramus of the jaw, at which point the parotial gland gives it but fittle protection in the newly born. If the lesten is in front of this point, any one of the terminal branches may be affected; most frequently it is the temperofacial branch. As only one blade of the forceps commonly touches the face in this region, the paralysis is, as a rule, unilateral.

Roulland has reported several cases not due to the forceps. In these
the pressure is believed to have been produced by the gramontory of the
sacrum at the superior strait, or by the ischimm at the inferior strait, as
paralysis followed when the head was long arrested at one of these points:
It was not seen with face or breech presentations. When facial paralysis
is of central origin at depends generally upon a maningeal bemorrhage
and the arm and leg of the same side as the face are involved. It as
between, possible for a very small continal homorrhage to produce
paralysis of the face only.

In repose, the only symptom noticed may be that the tye remains open upon the affected side, owing to paralysis of the exteculars pulpostrarum. When the muscles are called into action, as in coying, the while side of the face is seen to be affected. The paralysed side is amouth, full, and often appears to be somewhat smollen. The mouth is drawn to the side not affected. In this paralysis, the tongue, of course, is not implicated. It is therefore care that nursing is actionally interfered with.\(^1\) If the paralysis is of central origin, only the lower half of the face is involved, while in peripheral paralysis, as the trunk of the face is involved, while in peripheral paralysis, as the trunk of the nerve is injured, the upper half of the face, including the principal pulpebrarum, is also affected.

The paralysis is generally noticed on the first or account day of life, and sloes not increase in severity. Its coarse and termination depend apon the extent of the injury done to the nerve. Some idea of this may often be gained by the amount of injury to the soft parts, although this is not an infallible guide. In cases not due to the foreign, the paralysis is slight and disappears in a few days; the great majority of the forceps cases follow the same favorable course, the paralysis gradually disappearing without treatment in about two works. In more serious cases it may last for months, or it may be permission. The reaction of degueration is present in these severe cases, and there may even be perceptible atrophy of the muscles. This symptom is fortmately extremely ture.

Treatment.—Nothing should be done for the first but show except to protect the eye and keep it clean. If improvement has begun by the end of this time, the probabilities are that the case will require no treatment, if no improvement has taken place by the end of the third or fourth work, electricity should be used regularly and systematically. If the unseles respond to it, the farable current may be employed; if not galvanism should be used. The observed treatment should be continued for several mouths, or until recovery has taken place.

BRACHIAL BIRTH PALSY

This, semetimes called "obsertrical paralysis" or "Ducheme-Erb paralysis" is fortunately not a common condition. It is almost always undateral, though occasionally both orms are involved. It may result from spontaneous delivery but is vasily more frequent following operative interference in difficult labor. In the majority of case it is directly due to manipulation, though it may occur in the practice

The this connection it is to be presented that the printipal part in turning in done by the tempor, and not by the lips.

of the most skillful. Pressure from the application of forceps, while a possibility, is an infrequent cause, though long regarded as the most important one. The injury may be produced by any manipulation that forcebly draws the local and neck away from the shoulder. This puts the brachial plexus upon the stretch. If the force is slight, only stretching of the nerves is caused; if more extreme, lateration of the nerves is produced from share downward. The suprascapular nerve is by its position the one most exposed to injury and is the one that is first and most occurrely form. The fifth cervical next is affected, then the sixth,



For II.—Eur's Panarysis, Lary Aug. Infait two months and.

the seventh and perhaps the eighth and the first dersal. While the injury is almost always to the plexus alone it is probable that in some cases one or more of the roots in the cervical region may be torn from the cord. The amount of spontaneous improvement depends upon the extent of the lesion. When only averstretching has been produced, a complete recovery may take place. The same may be true when the laceration of the nerves has been slight. and the ends remain in apposition. When more ex-

tensive injury has taken place complete recovery cannot be expected. Hemorrhage has occurred and there has been laceration of the fascia as well as the nerves. The result is usually the production of a cicatricial mass that interrupts the continuity of the nerves and prevents their regeneration. The nerve impulses are thus blocked.

The paralysis in severe cases is noticed soon after hirth owing to the fact that the infant cannot use his arm. In less severe cases the paralysis may escape detection for several weeks.

The most common form of peripheral paralysis is that known as the "upper-arm type." The muscles paralysed are the deltoid, biceps, brachtalis entiers, espinator longue, and cometimes the supra- and infraspinatus. All these nuncles may be involved, or only part of them, and in varying degrees. The arm hangs lifeless by the side; it is rotated inward, the forearm promated, the pulse looking outward (Fig. 11). The forearm and hand are not affected, except in cases where the whole plexus has been beerated. In severe cases there may be anesthesia of the outer surface of the arm, in the region supplied by the circumflex and external rulaneous nerves. This is rarely marked, and in its slighter degrees it is very difficult to determine. It is characteristic of this paralysis that the triceps is not affected, so that power to extend the forestte remains, although it cannot be flexed. A notular mass in the region of the piexus may be felt. This is the result of the bemorrhage and the inflammatory reaction. Atrophy of the paralysed muscles occurs after a few weeks, but the muscles are so small and so covered with fat that it is rarely noticeable before the second year. It is most conspicuous in the deltoid. In all severe cases the reaction of degeneration is present. In some of the cases of long standing there occurs a sheetening of the tenden of the subscapularis muscle, often associated with subluvation of the humerus. The paralysis may be complicated with fracture of the elavide, the neck of the scapula, or the shaft of the humerus, or with spinoyscal separation of its bead. Injury confined to one nerve is very unconstoon. We have sen two cases in which there was temperary paralysis of only the muscles supplied by the musculo-spinal nerve. The explanation of such once is

The prognosis depends upon the secently of the injury. Some cases recover spontaneously in two or three months, improvement being observed within a few weeks, first in the baceps and last in the deltoid. Recovery after many months may take place even in cases apparently severe. Gradual improvement may continue to the end of the second year. The condition is, however, a very sense one. There is usually some permanent paralysis left and it may be so marked as to render the arm almost useless. Permanent paralysis is most frequently of the deltaid.

The electrical reactions are of some value in prognosis. If the sensecles respond to faradism, rapid improvement can generally be prophesied. If the reaction of degeneration is present, improvement will be slow and the paralysis is likely to be permanent.

The diagnosis is usually not difficult, since the great majority of cases are of the "upper-arm type" with classical symptoms. Perspheral pulsy of the arm can scarcely be confounded with that of scentral origin. If the lesion is central it is one of the rarest occurrences for the arm alone to be involved; either the leg or face, or both, are generally likewise affected. If the case does not come under observation until the child is a year old, it may be difficult, or without a good history it may be impossible to distinguish peripheral paralysis from that this to poliomyeldis. The particular group of numetes anyolved in Erlés paralysis is the chief diagnostic point.

In recent cases the disability resulting from the tenderness or pain of

syphilitic epiphysitis may simulate paralysis, but there is lacking the characteristic position of the arm, and a careful examination discloses the last that the paralysis is only apparent. This may affect both sides. Fracture of the slaticle or applyeed separation of the book of the homerus may also be mistaken for paralysis. In cases of long standing, paralysis of the delocid may resemble dislocation of the homerus. The reaction of degeneration differentiates paralysis from surgical injuries with similar deformities.

Treatment.-As soon as the paralysis is discovered the injured arm should be put at rest by morns of a sling, with the shoulder elevated in order to bring the ends of the nerves in apposition. At the end of two or three weeks goodle massage may be employed. In cases going on to permanent recovery improvement is rapid. At the end of two months it is generally possible to tell to what extent recovery will take place. If very little has been gained by that time, and if a surgeon expert in nerse surgery can be consulted, operation should be considered, for at this time less nerve deponeration will have taken place than at a later date and the regeneration of the nerves will require much less time. The operation consists in disserting out and saturing the nerty trunks whose continuity has been broken by the injury. A. S. Taylor, New York, from an extended experience, has reported marked improvement in some otherwise hopeless cases for this operation. Though useful in mild cases, but little is to be expected from manipulation and electricity in severe cases without esseration.

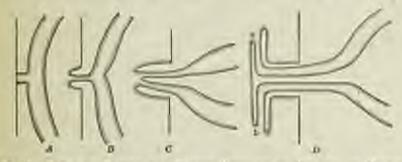
CHAPTER VII

TUMORS OF THE UMBILICUS, MASTITIS, ETC.

Oranulous.—This is nothing more than a mass of evaluant grantlations at the mubilisal stump. The mass is generally about the size of a per—sometimes larger—bloods readily, and has a thin, purulent discharge. It is promptly cured by the application of any simple astringent; powdered alam is probably the best. In case this is not successful, the granulations may be touched with nitrate of silver or snipped off with account.

Adenous, Murous Polypus, or Diverticulum Tumor—Umbilical Fistula.—The first three terms are used synonymously to describe an ambilical tumor covered with a noneurs membrane which is similar in structure to that of the small intestine. It is usually associated with an embilical fistula. This tumor is formed by a prolapse at the savel of the macous membrane of Morkel's diverticulum. This diverticulum is the remains of the omphalomesenteric duct. When it is present in ordents, it is found in various stages of development. Most frequently there is a blind people a few inches long given off from the lower part of the ileans. In other cases it may remain patent quite to the unfolicus, causing a feral fieldle (Fig. 18, A). As the intestine helow it is generally normal, this fieldle may persist for months or even years, giving rise to no symptoms except a alight focal discharge from the unfolicus. In certain cases intestinal worms have been discharged through it. It may close spontaneously so be closed by operation.

A prolapse of the mucous membrane lining the discriticulum produces an umbilical tenue with a fistula at its summit (Fig. 12, B). Thus is the most common form. A cross-section shows under the microscope the



For 12.-- Custing an Peters and Tonom Progress of Progress of Macker's Devianication. (Butth.)

structure of the intestinal nunceus membrane both as an external covering and being of the fictulous tract. The proluper may involve not only the nunceus membrane but the cutire intestinal wall. There then exists a conical tumor with a fatula which has but one external opening, but at a shart distance from the surface it hifurcates, one tranch leading upward and one downward (Fig. 12, C). A continuation of the prolupes gives a broad pedanenhated tumor (Fig. 13, D), which may reach the size of an erange. Its covering is the same as in the other forms. It may contain several cells of intestine. In this form there are usually two fistulous openings (a, b) which communicate with the intestine.

In all of these cases the tumor is smooth, irreducible, of a rosy pink toler, and from its surface there coxes a mucous discharge. Microscopical examination shows the external covering to be the same in structure as the infestinal mucous membrane. These tumors are generally small, targing in size from a pea to a small cherry, but they may be very much larger. A feeal fistula usually, but not invariably, counsts. In the condition represented in Fig. 12, B, it is easy to see how an oblitantion of the fistula may occur. The small tumors are readily carred by the light

ture. The larger ones are usually associated with other serious malformations of the intestines, which make the outlook had in almost every imbance.

UMBILICAL HERNIA

Herein into the umbilical cord is a rare congenital condition of a perious nature. It is due to some fetal defect, and varies in size from a small protrusion to complete etentration in which nearly all the abdominal organs are autoide the body. Many saces in which only intestinal coils are contained in the sur, though the turner is quite large, are amenable to surpical treatment, which should be instituted at once. In the very large ones the prognosis is bad.

The common umbilical hernia is quite a different condition, and while a source of much annovance it is rarely zerious. It is much more common in females than in males, and occurs especially in those who are poorly neurished and rachitic. The tumor is usually from one-fourth to one-half an inch in diameter; it may, however, be very large, and may even become strangulated, when a surgical operation may become necessary. The ordinary cases, however, require only mechanical treatment. The most important thing is prevention. For this purpose it is necessary, after the cord his separated, to place a firm ped over the navel and to use a sing abdominal hand for the first two or three months. After this period it is uncommon for hernia to develop. In cases coming under observation after the third or fourth month, the pad and abdominal bandage are inadequate, and other means must be employed to retain the hernia. The lest of these consists in the use of two adhesive strips applied aldiquely over the aldomen, crossing at the umbilious, the skin along the median line being folded inward so us to overlap the tumor, this forming the retention pod. A simple method of retention is to place over the tumor a coin or button covered with kid and hold it in position by a strip of adhesive plaster ten or twelve inches long. One should be cautions about using the small conical puls frequently employed, as these tend to dilute the opening rather than to close it. If the skin is made absolutely clean and zincoxid plaster used, excorations are rare. The dressing should be changed every week or ten days and worn for several months. After the first year all mechanical treatment is unsatisfactory. For the very small tomors it is really unnecessary to use any form of apparatus, since these cases ordinarily show hittle or no tendency to increase in size, and the retention apparatus causes more annovance than the hernia. These small herniae sometimes disappear spontaneously during childhood, and rarely need to considered in children over seven years of egs. Operation is solden necessary,

MASTITIS

According to Guillet, a certain amount of secretion in the breasts of the newly born is physiological. It is certainly very common. It is most abundant between the eighth and fifteenth days, but may continue in small quantities as late as the third mouth. It is seen with equal frequency in both sexes. The quantity of the secretion amounts in most cases only to a few drops; in some, however, as much as a dram has been obtained. Chemical analysis has shown this secretion to be essentially the same as the adult milk-containing fat, sugar, protein, and salts. In gross appearance it resembles collectrum. The researches of Sinety have shown that the mammary gland of the newly been contains cul-de-sacs lined with secreting cells, resembling those of the adult. During the period of secretion the gland is slightly reddened, its vessels turgid, and all the signs of functional activity are present. This condition in itself is of no practical importance, and in most cases, if left alone, the secretion ceases spontaneously after a week or ten days. It sometimes happens, however, that the presence of this secretion tempts the nurse or attendant to rub or squeeze the breast. Such manipulation occasionally leads to serious results by exciting a mustitis which may terminate in abscess. Mastitis is not a very rare condition, and although the inflammation is not usually severe, it may be serious and even fatal. The predisposing cause is the congestion which accompanies functional activity, usually in the second week. The counting cause is most often some form of traumatism-unduc pressure, the squeezing of the breasts, or rough handling by the nurse. Through abrasions or Essures thus produced, microorganisms find a ready stateance with the same result as in the adult. It seems possible that the germs may enter through the lactiferous ducts without any abrasion of the skin. Want of cleanliness is always a favorable condition for such infection.

The symptoms of mastrix usually begin during the second week of life. There is reduces, swelling, and the usual signs of inflammation, which may terminate in resolution or in suppuration. The process may be limited to the manusary region, or a diffuse phlegmoneus inflammation may be set up, and the case terminate fatally. In the female it is possible for the cicatrization which follows such an inflammation to interfere with the subsequent development of the gland. The general symptoms are restlessness, loss of sleep, disinclination to nurse, and loss of weight. In cases of diffuse phlegmonous inflammation the general symptoms are those of pyogenic infection.

The parts should to kept semipulously slown, and on no account should squeezing of the locusts to permitted. They should be protected

by a cotton pad. If acute inflammation develops, it should be freaten as a surgical affection.

INTESTINAL OBSTRUCTION

The most frequent causes of intestinal obstruction in the newly pore are malformations of the intectine; rarely it may be due to pressure from tumore, or from a persistent omphalomosenteric duct or artery. The various pathological conditions present in intestinal malformations are considered in the chapter on Diseases of the Intestines. The most comman sout of eletraction is at the anni, the bowel being normally formed throughout, lacking only the external orifice. The next most frequent condition is obstruction in the rectum, which may les due either to u meriliranous septum in the gut, or to obliteration of the tube for some distance. These rectal electractions are readily recognized. By the examining farger or a bougle the lower limit of the obstruction can be made out, but there is no means by which the upper limit can be determined except by spening the abdomen. When the obstruction is above the rectum, localization is more difficult; but the most frequent seat is the dusdenum. Of 38 cases collected by Gaertner, the seat of obstruction was the duolenem in 19 cases, the jejumm in 8, the flour in 11, the colon in 6, the ilenm and colon in 1. There is often abstruction at more than one point.

The symptoms vary with the seat and the degree of the obstruction. In atresia of the anns or rectum there is at first simply an absence of all discharges from the bosed. Later there is abdominal distention from dilatation of the sigmoid flexure and colon. After several days remeting begins. If there is alresia of the duodenous or any part of the small intestine, remitting begins early-norally by the second day of life-and it is persistent. Nothing is passed from the bowels after the first dark discharge of the centents of the colon, which is chiefly mucus. There is rapid asthenia, and death from insuition usually occurs in four or five days. The higher the obstruction the shorter the duration of life. If the condition is one of stenous only, the symptoms are similar to those described but less severe, and life may be prolonged for several weeks, or even months. The constitution in these cases is not absolute. When the cause of obstruction is external pressure, the symptoms do not always begin immediately after birth. We once saw a child in whom molling almormal was noticed for the first three weeks, but at the end of that tions there developed all the signs of acute intestinal obstruction. Lapurotomy revealed a loop of intestine constricted by a tiny cord, which was probably the remains of the amphalomesenteric duct.

Cases of imperferate annual membranens septum in the rectum arreadily relieved by proper surgical treatment. In the other varieties a obstruction, whether in the rectum in the colon, or in the small intestine, although life may be prolonged by the formation of an artificial annutio ultimate result is almost invariably field, death usually occurring from marasmus during the early weeks of life.

DIAPHRAGMATIC HERNIA

This is due to a congenital detriency in the disployagm, which is usually on the left side. Of 118 cases collected to Livingston, 83 were on the left side, 18 on the right, 4 were central, 2 were deable, in 1 the disployagm was absent. With small openings only a single cell of intestine, with large ones a considerable part of the abdominal contents, may



Pro. 13. A.—Distrimonante Hausta or this Richer State, Postermon Votes. Child sixtem months old; died of provinces at three and a half years.



Pag. 12. R.—Terr. Start. Demokrative array Asia; corresponde or Bosecus ps Sparrosesos. States of the right thorace early.

be found in the thoray. This causes displacement of the heart, usually to the right side, prevents the full expansion of the left lung, and if the determity occurs early in intra-uterine life the lung may remain rudimentary. If a large deficiency exists, infants may live but a few hours; with smaller ones, life may be prolonged indefinitely.

The symptoms noticed uses after birth are usually symmets, rapid, respiration, a sunken abdomen, an overdistended chest, and Symmen. Children aften live but a few hours. In these who survives a longer time dyspica is generally the most prominent symptom. It may be constant, it may occur in severe paroxysms, or there may be attacks of cyanous often of great severity, these being produced by an accumulation of gas in the storach or the thoracic part of the intestine. Other symptoms may at times suggest intestinal obstruction. The physical signs vary much from time to time. Sometimes those of presumotherax are present; at others there is so much dishess with the feeble respiratory sounds, as to suggest finid. The signs are usually upon the left side, with displacement of the heart to the right. A positive diagnosis can often be made by means of the X-ray after the administration of bismath. (See Figs. 13, A, and 13, B.) The condition is not amenable to treatment.

CONGENITAL STRIDOR

This term has been given to a rather rare form of dyspues seen in very young infants, beginning netally in the first days of life. Respiration is noisy and inspiration is accompanied by a marked creaking, or crowing sound, and with recession of the soft parts of the chest wall, which, especially at times of exertement, may be very great, yet there is no cyanosis and no subjective distress. In spote of the apparent difficulty of respiration the child seems conductable. Expiration is assume easy and voice and cry are normal. The strider diminishes when the child is very quiet but usually does not quite disappear even in sleep.

The symptoms begin in most cases immediately after birth or during the first week or ten days of life. They may increase for three or four weeks, then remain about stationary until the sixth or eighth month; after which with the growth of the largux the dyspnea and strider steadily diminish. By the end of the second year it is usually gone or heard only on occasion.

For our knowledge of this affection we are especially indebted to the observations of Thomson, of Edinburgh, who believes that the condition is primarily functional and due to a want of proper co-ordination of the respiratory muscles. Secondarily there is produced a felding of the epiglottis upon itself along the median line, so that its lateral borders approximate each other. In many of the cases reported, however, the change in the largux seems to be rather a malformation especially of the epiglottis, which greatly narrows the superior opening of the largux. Congenital strider is favored by the soft collapsible character of the structures of the largux in young infants and the strong suction force of inspiration.

The prognosis in most of these cases is good, the chief dangers being from intercurrent disease or from bronchopneuments. Considerable

deformity of the thorax may be produced (pigeon breast) which may persist to later childhood,

The diagnostic features of congenital strider are the noisy respiration with marked inspiratory dyspines and crowing, with the absence of distress or subjective symptoms of any kind. It seems to be more frequent in delicate children. Conditions with which it may be confounded are popilloms of the largux, largingsmus stridelies, catarrial croup, and largingeal spasm associated with adenoids. The first three of these are suched by the history and by the absence of changes in the voice; the last one by the fact that the child is not a month breather, that the dyspines is not increased by closing the month.

Congenital strider is not amountly to special treatment. Should the dyspuca reach an alarming degree trachectomy may be performed. The indications are to maintain the child's general nutrition and to protect him, so far as possible, from diseases of the upper respiratory tract.

SCLEREMA.

Sciercum is a condition characterized by hardening of the skin and subcutaneous tissues. It may occur in circumscribed areas or extend over nearly the entire body. It affects infants who are very feeble and usually terminates fatally. Although sciercum is chiefly seen in the first days of life it is not limited to the newly born, but may occur at any time during the first few months. It is not to be confounded with edema of the newly born, with which condition it is, however, sometimes associated. From published reports it appears to be of not very infrequent occurrence in Europe, chiefly in large foundling asylums. In America, sclerema is a rare disease. In the newly born, sclerema affects those who are premature or very feeble, nametimes those who are sphilitic. Later it may follow any condition leading to extreme exhaustion, especially the different forms of distribed disease.

The first thing to attract attention is usually the induration of the skin. It is often seen first in the calves or the thighs, sometimes first in the checks, but soon extends over the greater part of the body. It is especially marked in the checks, buttocks, and back, and regions where adipose tissue is abundant. It may affect the body uniformly or in circumscribed areas. The skin may be smooth or it may appear somewhat lobulated. The color is normal or slightly bluish, often tinged with yellow. The lips are blue, and the capillary circulation so feeble that after pressure upon the nucle the blood returns slowly at not at all. The limbs are stiff and beard-like. The skin is cold to the bruch, and often the thermameter in the axilla will not rise above 20° F. In one recorded case the avillary temperature was only 71° F. The general leading of the body has been well likewed to that of a half-frozen cadarer. The tangue and the mix-ous membrane of the mouth are cold) no radial pulse can be felt; the respondion is slow, irregular, emberrassed, and at times the naturements of the thorax are scarcely perceptible. The cry is a feeble white, is arecely audible. The duration of the discuss is usually from three to four days. Death occurs slowly and quietly. If recovery takes place there is gradual improvement in the circulation and matrition, and, later, a disappearance of the areas of induration.

The causes of selections are general, the most important factors being less of fluids, great feetdeness with lowering of the body temperature, and, in consequence, hardening of the subsutanessis fail. There are no essential lesions in this disease. Atdicators is often persent, and may have something more than an arcidental association, as incomplete peration of the blood is no doubt a factor in the production of the symptoms. Microscopical examination in typical cases has shown the skin to be normal.

The progression, but it is not invariably fatal. In its milder forms, where treatment is began early, recovery may take place. The diagnosis is to be made from relevan by the fact that there is no jetting upon pressure, by the rigidity of the body, and by the great reduction in the temperature. The most important thing in treatment is artificial heat; nothing but the incubator is efficient. In addition to this, care should be taken to pressure the peneral nutrition by careful feeding and by all other means possible.

INANITION FEVER

The term installion fever is not altogether a satisfactory one; but, notif these cases are better understood, it is adopted because it emphasizes the very close connection which exists between the rise of temperature and the condition of instaltion or starvation. Under this heading are included cases seen during the first five days of life—generally from the second to the fourth day—in which there is an elevation of temperature, apparently due to the fact that the infant gets very little, frequently nothing at all, from the breast at which he is being suckled. It is further characteristic of these cases that the temperature falls when the child is put upon a full breast, or when artificial feeding is began, or even when water is administered, if freely given. Some have accribed the symptoms to uric-need infurction of the kidness.

So far no our knowledge goes, the first to call attention to this candition was McLane (New York), who in 1890 reported to one of the medical societies an extraordinary case of hyperpyrexia in a newly-horn child. The infant was found on the sixth day with a temperature of 196° F., near which point it had remained for three days. The child was being suckled at a breast which was found to be absolutely dry. A wet-nurse was procured, the temperature fell to normal in a few hours, and the child, which when first seen was apparently in a hopeless condition, was soon perfectly well.

Since that time very extensive observations, extending to upward of three thousand cases, have been made at the Sloane and the Numery and Child's Hospitals, which have established the fact that a rise of temperature to 100° or oven 104° F, is quite common in newly-born infants during the first few days. This fever is accompanied by no evidences of local disease, and ceases in nursing infants with the establishment of the free scretion of nulls. The fall in temperature is often raped, dropping to the normal in a few bours after having continued for three or four days, and in a large number of cases it does not rise again.

The following case is a fairly typical one of the more severe form: The patient was the second child, the first having died at the age of bendays, from no disease, it was said, but simply from exhaustion. At botth the infant, a boy, weighed eight and a quarter pounds and was apparently rigorous. During the first forty-eight hours his loss in weight was feet and a half ounces and his condition good. He was seen on the evening of the third day. In the preceding twenty-four hours he had lost eight ourses in weight, and the temperature had gradually rises, until at the time of our visit it was 102.8° F. The body was limp, the child making no resistance to examination. He cried with a feeble whine; the resilessress of the early part of the day laving given place to complete spathy. The lips and skin were very dry, the fontmel sunker, the pube weak-As the father, a physician, expressed it, "he had been wiltim through the day like a flower in the sun." Although put to the breast regularly. the child had apparently obtained very little. It was, in fact, impossible to express any milk from the mether's termsts. Water was freely given and a web-surse secured in a low hours. The first milk was taken from the not-name at 11 y.s., and the temperature, which fell gradually floring the night, was normal the next morning and did not rise again. (See chart, Fig. 14.) During the succeeding four may the shild gained eighteen somes in weight, and at the end of a week was at well as an average infant of his age.

The symptoms are so uniform and so characteristic that they make for these cases of fever a class by themselves. The frequency with which this is seen is shown by the following statistics: Among 200 infants taken successively at the Nursery and Child's Hospital, 50 had fever flaving the first five days, reaching 101° F. or over, which was not

explained by ordinary causes and followed the reurse above described. In 200 ancressive children been at the Sleane Hospital, there were 135 with a similar fever. It was seen in vigorous infants as well as in those who were delicate. The usual duration of the fever was three days, the temperature generally touching the highest point upon the third or fourth day of life. In about two-thirds of the cases the temperature did not rise above 102° F.; in 9 it was 104° F. or over, the highest recorded being 106° F. The fall was generally quite abrupt, although not always so.



Fro. 14.—Tempunature Chart. Incomes Favor.

Daily weighings, which were made in these cases, showed that the infants continued to lose weight while the fever continued, and that the loss almost invariably exceeded by several ounces that of the children who had no fever. The maximum loss nobed was twenty-eight ounces. In quite a large number of cases it exceeded twenty ounces. As a rule the infants began to gain in weight when the temperature remained at the normal point, but not until then.

The symptoms presented by these infants were a bot, dry skinmarked restlessness, dry lips, and a disposition to suck vigorously anything within reach. With very

high temperature there were considerable prestration and weakened pulse. In the less severe cases there were only crying and restlessness. The rapidity with which the symptoms disappeared when the children were web-nursed or properly fed, was very striking.

It is important that this fever should be recognized, because it gives at times the first warning of a condition which may prove fatal. The extra loss of ten or fifteen cances in the first week is a serious hundicap to newly-born infants, the effect of which may last for several week. The temperature of every child should be taken during the first week. All the neual local causes of fever are first to be excluded by a physical examination. This fever can hardly be confounded with that due to progenic infection, which rarely begins before the fifth or sixth day.

The treatment is simple, viz., to give water regularly every two hours, in quantities up to an ounce at a time if required by the thirst of the shald. This should be done in every case where the temperature reaches 101° F. When the temperature does not at once begin to fall, the infant

should be put upon another breast or artificial feeding should be begun. Examination of the breasts from which the child has been norsing will usually reveal the fact that the secretion of milk is very scenty and often entirely absent.

Such a fever we have occasionally seen in older infants, usually in those who are nursing dry breasts or where fluid food and water have been withheld because of some gastric disturbance. It yields as promptly to treatment as does the same condition in the newly born.



SECTION II

NUTRITION

CHAPTER I

Nursirion in its broadest sense is the most important branch of pediatries. In no other field and at no other time of life does prophylaxis give such results as in the conditions of nutration in infancy. The largest part of the immense mortality of the first year is traceable directly to disorders of nutration. The importance of correct ideas regarding this subject can hardly be overestimated. The problem is not simply to save life during the perilous first year, but to adopt those means which shall tend to healthy growth and normal development. The child must be fed so as to avoid not only the immediate dangers of acute indigestion, diarrhen, and marastons, but the more remote ones of chronic indigestion, rickets, scurry, and general malautrition, since these conditions are the most imperiant predisposing causes of acute discuse in party life.

One of the difficulties has always been that temporary success may mean ultimate failure. If the injurious effects of improper feeding were immediately manifest there would be very much less of it than exists at the present time. Many things are valuable as temporary foods, which when used permanently are injurious. No better illustration of this is seen than in the tao exclusive use of the carbolivirate foods. Infants fed upon many of the proprietary foods often grow very fal, and for the time appear to be properly nourished. The effect of the absence from the diet of some of those elements which are of sital importance may not be evident for months. The physiological laws regarding the requirements of the growing organism cannot be ignored without serious consequences, which will scener or later be evident. Correct pleas of infant feeling are based upon a knowledge of these laws. An accurate understanding of fundamental principles is essential to success and the vast majority of failures may be ascribed to ignorance or disregard of them.

NUTRITION

THE FOOD CONSTITUENTS AND THE PURPOSES THEY SUBSERVE IN NUTRITION

In infancy and childhood, as in adult life, the elements of the food are five in number: protein, fat, carbohydrates, mineral salts and water,³. The forms in which they must be furnished to the childhard the relative quantities in which they are demanded, are different from those required by the adult. One reason for this difference is the delicute structure of the organs of digestion in infancy, and their inability to assimilate certain forms of food. Again, prevision must be unde not only for the natural waste of the body, but for its rapid growth, nearly trebling in size, as it does, during the first twelve months,

Amount of Food Required.—The attempt has been made to determine accurately the amount of food which an infant should receive during the first year. The food of infants who were thriving satisfarterily has been measured, and many metabolism experiments have been carried out for the purpose of definitely settling this question. While all these observations have shed much light upon the subject we are not yet alice to reduce to a mathematical formula the amount of food which shall be given to keep an infant in health and enable him to develop normally, As yet, the results of intelligent clinical observation of infants form our lost gride as to food requirements. Individual infants, though they may all be equally healthy, differ very much in this respect, depending upon their weight, their size and also much upon their physical activity. One that is particularly active or restless requires more food than does one who is very quiet and lethangio. The size of the body, or the surface area, is doubtless of much more importance in estimating food requirements than the weight, but the latter is so much more easily determined that it has come into general use in estimating the amount of food to be given per diese. It is a matter of general agreement that the requirements of the infant, relatively to the weight, are greatest during the first mouths of life and become gradually less, so that by the end of the first year they are only about three-fourths as great as during the first month. Heabner placed the child's needs at 100 calories per kilo (45 per pound) during the first quarter year and at 70 per kilo (30 per pound) during the last quarter year. These figures have been much used as an arbitrary standand, and indeed they do famish an excellent starting point for the feeding of an individual child, but they can hardly do more. The subsequent variations in the amount of food must be decided by the child's deman-

¹Three are other substances whose presence in the food is vitally necessary for life, such, for instance, as the vitamins. They exist in most of the common articles of food. Their channel composition is uncertain. Their abscuce produces definite symptoms.

strated needs and his digestive capacity; but wide variations from these averages, whether above or below them, are usually found to be either inadequate or disturbing. Again, these amounts are designed for healthy infants with good digestion. Sick children, or those suffering from digestive disturbances, must be fed according to the capacity of their digestion. The expression in colories of the energy value of the food does not imply that this is to be regarded as a method of feeding. It is only a method of stating the amount of food which a child is receiving, in a more accurate and scientific way than others that have been employed, e.g., the number of concess given daily, which really represents only the volume of the food, or tells rather the amount of water in which the food is given.

The calculation of the total food in terms of energy units is chiefly of assistance in enabling one to recognize readily whether an infant is receiving too much or too little food.

In determining the calories of the food it is calculated that:

1 gram of fat yields 9.3 calories 1 " marbolydrate 41 " 1 " protein 41 "

Protein.—Protein is essential to life, since it is the only kind of food which is capable of replacing the continuous nitrogenous waste of the cells of the body upon which health depends. Protein is also indispensable for growth. In the adult only the requirements of repair are to be supplied. In the child a much larger amount is demanded to provide for growth. Without the aid either of the fats or the carbolydrates, protein may sustain life for a considerable time; but in so doing a great everse of such food in required. When fats and carbolydrates are added to the food much less protein is required to replace the nitrogenous waste.

Of all the forms in which protein food may be furnished to the body, in proportion to its notrogen content, milk taxes the digestive organs least. Furthermore, there is no other form of pretain in which those amino-acids which have been shown to be essential for growth are so abundantly supplied as in milk. These facts are of great importance and indicate the superiority of milk as a food for infants, particularly during the first year. The protein of woman's milk is very readily digested. Regarding the protein of cow's milk there is no doubt that the view formerly tabl that it was difficult of digestion was erroneous. On the contrary, under most conditions it is digested and absorbed with facility. During most of the first year, milk furnishes all the protein that is needed for proper nutrition. But as con's milk protein is low in certain important amino-acids, a larger amount of it must be given than the

protein contained in woman's milk, or growth will suffer. During the second year most, eggs, etc., may add to the protein of the friet.

The digestion of protein is begun in the storach but is principally carried on in the intestines. The alleanness and populate produced by gastric and pancreatic digestion are broken up as the result of the action of the srepsin of the intestinal junce into polypoptide and finally intoamino-acids. It is as animo-acide that nearly all of the nitragen is absorbed. In almost all circumstances, the nitrogen of the protein is well absorbed. The bendency to retain nitrogen is one of the striking attributes of the infant. He retains this if it is in any way possible and may continue to do so even when being greatly in weight. This may be taken as an indication of the great efforts that the body makes to further growth.

The nitrogen which is not retained is largely excreted by the arine. The nitrogen of the foces is relatively small in amount, is influenced somewhat by the kind of food and is in considerable part derived from the intentinal secretions which themselves contain a certain amount of proteon.

In artificial feeding it has been maintained that a large excess of nitrogeneous products must be disposed of by digostion and elimination and that this taxes the organs of digestics and exerction. It may be said that there is at the present time no proof that milk protein even in considerable excess is dangerous to the welfare of the infant.

The protonged use of a diet in which the protein is insufficient in amount or defective in character produces a certain definite group of symptoms which are not always referred to their proper cause. In infants the most striking are slower growth, anemia, poor circulation, leeble mascular power, disinclimation to exertion, and various functional nervous disturbances. Such shidten are often very fat. Vegetable proteins do not seem able permanently to take the place of animal proteins in the food of young infants for the reason that most of them are deficient in some of the essential animomends. Since in milk and in fact in almost all the foods of the infant a very constant relation exists between the protein and the salts, it is somewhat difficult to separate symptoms due to low protein from those due to low salts; the two are often combined.

The injection of case in in large amount produces in infants, large, dry, light colored stools, often of an alkaline reaction. They also contain a high proportion of mineral salts. With these stools there is usually constipation. While this effect in health is one not to be desired, it is decidedly advantageous in diarrhea to combut the fermentation produced by carbohydrates and fats. For this reason, as will be seen later, protein in large amount is a valuable therapeutic ressedy for many intestinal conditions during infancy and childhood. Pats.—Fats are a most important source of energy to the body, their caloric value being a little more than twice as great as that of either the carbohydrates or the protein. They save nitrogenous wasts and increase the body weight. The large amount of fat stored up in the subcutaneous tissues in infancy is one of the best studences of health.

The amount of fat received by a breast-fed infant is relatively much greater than that given to adults in a normal diet. A well-nourished, warsing infant weighing fifteen pounds actually receives about one-half as much fat as is allowed in a ration for an adult doing moderate work, who weighs ten times as much. There can be no dould that fat is beneficial for infants and that those who can take a reasonable amount of fat throse better than these who can not. It is also plain that the one of the ingredients of cow's milk most difficult for the infant to digest in the fat.

Fats may, for a considerable time, be largely replaced by the carbohydrates; but nutrition suffers if this substitution is complete or long continued. Fats are acted upon very slightly in the stomach, although they greatly retard the emptying of the stomach. Their direction in the intestine is, under normal conditions, very complete, and only a small percentage of the fat posses through the intestine unchanged. Under termal conditions, from 80 to 20 per cent of the fat ingested is absorbed either as fatty acids or as soaps. No neutral fat can be absorbed.

When the diet contains fat and protein in comolerable quantity and is low in carbelcolrate, stools are formed consisting largely of calcium and magnesium scape, and the loss of these substances may even be so great that a negative balance of these minerals results. In certain circumstances, fats in the intestine may be decomposed and acids formed, but this rarely occurs unless carbelcydrates in excess are also given. As a result of this formentation, scritating products—chiefly the lower fatty acids—are formed, and these readily provoke diarrhea. In the diarrheal stools there may be sufficient potassium and actions loss to bring about a negative balance of these minerals. The influence of the fat, therefore, upon the mineral balance is an important one.

Carbehydrates.—Although, like the fats, these can not replace the nitrogenous waste of the body, they are important aids in sparing the protein, and in this respect they are even more valuable than the fats. The carbohydrates are partly converted into fat, and may thus increase the body weight. They are capable of replacing the fat-waste of the body.

Carbohydrates are the most abundant of the solid elements of the food, although they form a smaller percentage of the entire quantity of food in infancy thun in adult life. The soluble carbohydrates which are used as foods for infants are: milk sugar, case sugar and mixtures of multose and dextrin. Maltose in a pure form is not need on account of its cost and because it has no advantages. Mixtures containing mallose line distinct advantages in some eigenmotances. Since all sugars are finally converted into glucose, they are, to a certain extent, interchangeable. Malk augus has an advantage in not fermenting with the common varieties of yeast present in the stomach as do both maltone and cane sugar. Except for this, there is not much to choose between milk sugar and cane sugar. Gain in weight is satisfactory with either, and they are equally safe. They have the same disadvantages and dangers in that they readily undergo fermentation in the intestine by the action of hacteria. As a result of this fermentation, lower fatty acids are formed not only from the sugar but also from the fats which are present in the food, with the result which has been described above under the fermentation due to excessive quantities of fat.

The ability of the young infant to digest starches is relatively feells, although this power does exist to some degree from hirth; but the greater part of the carbohydrates required should be furnished in the form of sugar. To infants of four months and over, starches may at times advantageously be added to the diet, and after seven or eight months the quantity may be considerably increased. But in whatever form or quantity used therough cooking is necessary.

The advantages of the carbohydrates as foods depend upon the case with which they are digested and absorbed. They are at a great disadvantage on account of the readances with which all of them, and especially the sugars, undergo fermentation in different parts of the alimentary tract. The mixtures of multose and dextrin, for some unexplained reason, are often rafer to give to stabline who have suffered from diarribea. While they themselves have a tendency to cause rather loose, brownish stools, they do not so readily undergo excessive fermentation and may sometimes be given with safety when other sugars, especially factors, would cause serious disturbances.

A diet consisting too exclusively of cartchydrates often leads to a rapid increase in weight, but it is not accompanied by a proportionate increase in strength. Infants so led have but little resistance, and many of them become rachitte. The easy digestion of foods consisting chiefly of soluble carbohydrates, such as sweetened condensed milk and the proprietary infant foods, and the rapidity with which children as fed gain in weight, lead to a great misapprehension in regard to their value as foods. The ultimate results of such one-sided feeding, if long continued, are almost invariably disastrous.

In building up the cells of the body the protein is first in importance, but in the production of energy the fats and the carbohydrates have a greater value. In a proper diet all of these elements are represented:

Mineral Salts.—The great importance of the mineral salts in the natrition of infants and children has only recently been appreciated. These salts are important not only for growth, but for all the physical and chemical processes which are carried on in the body. If they are not furnished in sufficient amount in the food, or if conditions exist in which their absorption, retention and utilization are interfered with, all the functions of the body are disturbed and life may be jeopardized. Except in the case of infants fed upon the proprietary foods, salts are very soldom lacking in the food. These who receive woman's milk usually receive an adequate supply; and those who are fed on con's milk receive not only the salts required, but a very considerable excess of them, often two or three times the requirements of the child. This excess apparently does no harm, as it is either not absorbed or is excreted by the intestines. or kidneys. The mineral salts form from 10 to 35 per cent of the dried matter of the normal stool. For perfect nutrition not only must all the mineral salts be furnished in the food but the other elements of the food must not have an injurious effect upon their retention. The chief dangers to the retention of sedium and potassium arise from fermentation of carbohydrates and fats in the intestine. Disturbances in the metabolism of the salts are very frequent and are no doubt at the basis of many common nutritional disturbances of infancy.

Water.—The food of all young mammals consists of from eighty to ainsty per cent of water. This is needed for the solution of certain parts of the food, such as the sugar, the soits, and some of the protein, and for the suspension of other protein and the smulsified fat. All the food is thus dissolved or very finely divided so as to be more readily acted upon by the delicate digestive organs of the infant. Water is needed also in large quantities for the rapid elemenation of the waste of the body.

The amount of fluid required by the infant, in proportion to his size and weight, is much greater than that required by the neult. During early infancy an infant should receive saily an amount of finit equal to about one-fifth his body weight. As it is practically impossible to give to a young infant any considerable part of this as water, this figure gives us an important guide as to the volume of the food to be given daily to an artificially-fed infant. The passage of a large amount of urine of low specific gravity is one of the physiological conditions of infancy and sufficient water must be furnished to the infant to make this possible. It is not therefore a matter of indifference whether we give the daily greent of food with twenty or with thirty-five summs of water. After six months fluids can be given in the form of fruit juices, broth, etc., and, besides, the older infant will usually take water in proper amount without difficulty, so that the same relation of the volume of food to the body weight need not be maintained. Of the water received it is estimated that 50 per cent is eliminated by the kidneys; 33 per cent by the lungs. 4 per cent by the intestines, and that from I to 2 per cent is retained.

CHAPTER II

THE INPANTS DIETARY

WOMAN'S MILK

Woman's milk is the ideal infant-food. A knowledge of its character, composition, and variations is indispensable, for upon this knowledge are based all our substitutes for woman's milk when this can not be obtained.

Weman's milk is a secretion of the mammary glands and not a mere transmistion from the blood-vessels; although under almortial conditions it may partake more of the character of a transmistion than a secretion. A few drops may be squeezed from the breasts before parturition; generally speaking, however, it is only present after delivery. During the first two days the secretion is scanty. Usually upon the third or fourth day it becomes well established, although it may be delayed many days longer and yet become abundant. During the period of lactation, milk is constantly formed in the mammary glands, but the process is more active while the child is at the breast.

Physical Characters.—Woman's milk is of a bluish-white color and quite sweet to the taste. When freelily drawn its reaction is amphaterio to litmus, or slightly acid to phenolphthalein. The specific gravity varies between 1.026 and 1.036, the average being 1.031 at 60° F. On the addition of acetic acid only a slight congulation is seen, this being in the form of small florenti, and never in large masses as is the case in cow's milk. Microscopically, there are seen great numbers of fat-globules nearly uniform in size and some granular matter. Occasionally there are present opithelial cells from the milk-ducts or from the nipple.

Early Milk.—The secretion of the early days of lactation to which the term "colortrum" has been given, differs quite markedly from the later milk. It is of a deep-yellow color, which is chiefly due to the colortrum-corpuscles. It has a specific gravity of 1.600 to 1.605, a strongly alkaline reaction, and is congulated into solid masses by bent, and sometimes the milk of the first days congulates spontaneously. It is very rich in protein and in salts. Microscopically the fat-globales are of unequal size, and there are present large numbers of granular bodies known as colostrum-corpuscles. These are four or five times the size of the milkglobules, and they are probably his securities in which are contained numerous fat granules. They are much larger than ordinary lencorries and are nucleated.

The colestrum-corpuscles are very abundant during the first few days,

but under normal conditions they are not found after the tenth or twelfth day.

Composition of Calculrate

	First and second days	Two to
Pat	2.38	3.00
Sugar		7.50
Protein	8.60	2.25
Ai6	0.37	9:30
Water	85.27	86.95
	100:00	100.00

The characteristic features of colostrum milk continue for a period varying from five to ten days; but it is not until about the end of the first menth that the milk assumes its stable or "mature" character. The milk of the intermediate period is sometimes spoken of as "transition milk." It shows a marked but gradual fall in the protein and ash, and a moderate rise in the fat and sugar until the composition of mature milk is reached; after this time no constant or regular changes are seen in the proportion of the different constituents until near the close of lactation.

Daily Quantity.—Exact information upon this point is difficult to obtain. There are recorded, however, extended observations made with great cure upon a number of cases. The eight cases quoted below t were

'Hackner's cases (Jahrb. f. Kinderh., xv, 23; xxi, 234). Case I. Penale; birth-weight, 7 pounds 14 canove (3,000 grams). First week, last 1) cance (45 grams); after this gained steadily during the investy-three weeks of observation; from second to sinth week, average weekly gain 8 cances (241 grams); from teath to eighteenth week, average gain 45 cances (128 grams); from nineteenth to twenty-third week, average gain 4 cances (128 grams); weight at the end of twenty-third week, 11 pounds (6,690 grams).

Case II. Male; both-weight 61 pounds (2,500 grams). Loss, first week, 2 ounces (90 grams); after this gained steadily during the alexen weeks of observation; from second to eleventh week, average weekly gain 71 comess (214 grams); weight at end of eleventh week, 11 pounds 2 comess (5,045 grams).

Case III. Fermile; forth-weight 5 points 9 conces (1,629 grams). Gain, first week, 15 conce (45 grams); during the succeeding twenty-one weeks of observation, average weekly gain 5 conces (141 grams); weight at the end of twenty-second week, 10 possels 5 conces (4,630 grams).

Laure's case (These, Paris, 1889). Female; both-weight 8 pounds 13 ounces (4000 grams); loss, first week, 8 ounces (225 grams); after this gained stendily during the name weeks of observation, on an average 91 ounces (268 grams) weekly; at the end of ninth week, weight 13 pounds 31 ounces (6,000 grams).

Ablicid's case (Doutsch, Zimbr J. Prokt, Med. 1878). Birth-weight 7 pounds 14 camers (3,300 grams). Observations continued from fourth to thirtieth week. During first ten weeks, average weekly gain 50 camers (161 grams); from elecciath to twentieth week, 71 camers (214 grams); from twenty-first to thirtieth all healthy infants, noreing exclusively and gaining steadily in weight.

From these observations, and others less extended, the average daily quantity of milk secreted under normal conditions of bealth may be assumed to be pretty nearly as follows:

	Approximately,			
At the end of the first week	10 to 16 eg.	(300 50-	300 c.cm.)	
During the second week.	13 to 18 or.	400 to	550 e.em.)	
During the third week	14 to 24 ca.	(433 to	720 c.cm.)	
During the fourth week.	Iff to 26 to.	(500 to	800 c.cm.)	
From the fifth to the thurseenth week.	20 to 34 oc.			
From the fourth to the aesth month	24 to 38 ea.	(720 to 1	,150 c.cm.)	
From the eath to the month month	20 to 40 an.	(909 to 1	220 c.ma.)	

It will be noted that the amount increases very rapidly up to about the eighth week, and after this much more slowly. The amount of milk varies also with the domands of the child in a very striking way.\(^1\) The week, \$ ounces (168 grans); at the end of the thirtieth week, weight 18 pounds 90 persons (8,833 grans).

Four Chilero, f. Kinderh, alli, 1951. Three cases.

In all these cases the amount of mile was determined by weighing the infant both before and after every naming during the entire period of observation. The following table gives in a condensed form the daily quantity of milk in these cases:

Time.	Hadnet's let Case	Hudster's 28 Com.	Market's M Cree	Lamy's Com-	ALMAT »	S Cases. Average.
	Griena	Grans	Graus.	Grame.	Crane	Grane
let day	.20	75	20	****	****	
24 day	120	135	45			1000
3d day	265	325	20	125		
4th day	429	295	99	222	1000	1991
5th day.	360	290	124	400	1000	256
th day	374	319	136 J	475	1006	Sirenian
7th day	423	353	156	500	1111	Lit work)
Average 2d week	497	423	229	556		25941
Average 3d week	550	466	334	730	1016	11111
Average 4th week	394	531	379	510	576	610
Average 5th week		561	447	944	655	667
Average 6th week.	799	684	472	975	791	763
Average 7th work		651	325	1.038	811	802
Average 8th week		730	568	1,024	545	K15
Average 5th week,		665	.584	1,085	810	830
Average 10th to 13th week			600	2,000	509	755
Average 14th to 17th week		7772	673	5110	983	845
Average 18th to 23d week.	870	1414	700		1,929	929
Average 24th to lifth week		111	1000	11111	1,145	1,003

There are a number of recorded instances in which the amount of milk secreted has been quite extensedinary—in some cases as much as four quarte duity. Lectation in exceptional instances also is unduly prolonged. We know of one well authenticated American pass in which it continued for seven years. Among the Japanese it is frequent for it to continue up to three or four years. Among the Hottentots and other savage races lactation may be prolonged until the sixth or seventh year.

quantities mentioned can not be taken as an absolute guide to the amount of food to be given to bettle-fed infants. Breast milk contains an average of twelve per cent solids; while the modification of cow's milk best suited to the early months soliden has more than from nine to cleven per cent solids. For this period, therefore, somewhat larger quantities are needed than of breast milk:

A comparison of the daily amount of milk taken with the weight of the child at the different periods, about that both during the early and the later periods the larger children book not only more milk, but considerably more in proportion to their body weight than did the smaller ones. This harmonizes with the common observation that small children are much more likely to be overfed than large ones.

The average quantity taken at one numing by five of the children previously mentioned was as follows:

	Agen	minutely.	
During the first week	sall on	(38 to 45 c.cm.	5
During the second week 1	to 3 or.	(35 to 95 c.em	30
During the third week		(15 to 120 c.cm.	
During the fourth week		(45 to 140 e.ma.	
From the fifth to the seventh week 2		(90 to 130 c.cm.	
From the eighth to the eleventh week 2)			
During the fourth month			
During the fifth month			
During the south month	50 F Od.	120 to 220 c.cm.	ж

Between the limits mentioned the greater number of cases will undoubtedly fall. The amount taken at one time is, however, modified by the frequency of nursing, and is therefore not so good a guide to the amount of food required, as is the quantity taken in twenty-four hours.

Composition.—According to the analyses of Pfeiffer, Kornig, Leeds, Harrington, Adriance, Courtney and Fales and others, the composition of human milk is as follows:

	Surrey Abstern (Mature 2004)	Concros Reptly Valorious
Fat	Fer cost 3 30 7 20 1 25 0 20 87 35	Per cost 3.00 to 5.00 6.50 * 8.00 1.00 * 2.00 0.18 * 0.25 89.32 * 84.73
	100.00	100.00 100.00

In the older analyses the percentage of protein was almost invariably made too high and the sugar too law. After the first mouth there are no regular changes in composition until near the end of lactation. This is a point to be beene in mind in the selection of web-turses. Milk also contains certain natural ferments which, though little understood, are believed to have a function in digestion.

Protein.—The important forms of protein are casein and lactablemin; several others, lactoglobulia, lactoprotein and nuclein are also described. The casein is in suspension by vertue of the presence of calcium phosphate in the milk, with which it is probably in combination. It congulates only slightly with remost, while sectic acid produces a loose flocculent precipitate. The lactablemin resembles the serum-albumin of the blood. In woman's milk it is nearly twice as abundant as easin. Its proportion to casein is nearly twelve times as great as in case's milk.

The total protein of normal mature milk is usually between 1.6 and 1.5 per cent. In abnormal specimens the variations are from 0.7 to 3.5 per cent. The total protein is highest in the colostrum period; it falls steadily to the latter part of the first month. After this time, during the mature period, the variations are slight, but it tends to fall slewly. Toward the end of lactation the proportion of protein falls quite rapidly.

Fat.—This exists in the form of minute globules, which are held in a state of permaneut emulsion by the alluminous solution in which they are suspenfied. The fat of woman's milk is chiefly made up of the neutral fats—palmitin, myristin, stearm and obein; the last mentioned predominating. There are also small quantities of free fatty scale, but these are much less in amount than in cow's milk. The fat of woman's milk is relatively low in volatile fatty scale, compared with that of cow's milk. The proportion of fat is subject to even wider variations than is that of the protein, 3.5 per cent being taken as the normal average. In a series of tharty-door analyses the fat varied between 1.12 and 6.65 per cent. The highest percentage we have known was 10.91. In forty-three analyses by Leeds, the variations were between 3.11 and 6.89 per cent. The proportion is very little affected by the period of hartation.

Super.—The sugar is in solution. Its proportion is more nearly constant under all conditions them any other constituent of milk. The codinary variations are usually within the limits of 6.5 and 8 per cent.

Ask.—The average proportion of inorganic salts is 0.20 per cent, or a little more than one-fourth that of cow's milk. The percentage compartion of the solt se compared with that of cow's milk is given in a absorption chapter.

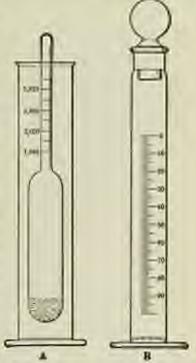
While the exception of calcium phosphate nearly all the salts are in solution. The milk of the first four days is very rich in salts, eldefly owing to the large proportion of solutes and potossium chlorid; after the first month the normal variations, are elight and inconstant,

From thirty-eight analyses by Courtney and Fales at the Babos' Hospital, the following average figures were obtained of the composition of the

The Examination of Milk.—The ward composition of human milk is to be determined only by a complete clamical analysis. Many variations in composition the physician may readily ascertain for himself by simple methods.

The quantity of milk secreted by the breasts may be estimated by the quantity which may be drawn by a breast-pump, although this is not a vers reliable test. If the child purses habitually thirty or forty minutes, the probabilities are very strong that the milk is seasty. If the breasts at nursing time are full, hand, and tense, the supply is probside alcandant. If the breasts are soft and flabby, and appear to fill only while the child is nursing, it is almost certain that the quantity is small. The only really reliable test is weighing the infant just before and after nursing, upon an accurate pair of scales sufficiently sensitive to indicate half-courses. This should be repeated several times in the day.

The reaction of woman's milk even when freshly drawn is rarely alkaline, being amphetene to litters, or elightly and to phenolphthalein.



Pro. 15.—Apparatus ross Examovarson or Woman's Muss. The authors' incommer and cross-gauge."

The specific gravity may be taken with any small hydrometer graduated from 1,010 to 1,010 (Fig. 15, A). The specific gravity is lowered by the fat, but increased by the other soluls. An ordinary uniconseter will answer every purpose, the only

ash of woman's welk at the different periods of hieration. (Amer. Jose, Diseases of Children, Oct., 1915.)

Protect	No. of Atalysis	$\Sigma_{n}^{\mathrm{odd}}$	Cab	MgO	P/Os	Nati.	Ke0	a
Colorym 1, 12 dept Transition 12 dept Lady martin (1 dept Stable martin (2 dept Stable martin (3 dept Lady martin (3 dept	5 co co	5077 5467 2006 2006 2009 FICX	0418 0400 0466 0456 0290	6881 8007 8003 8074 8070	0479 0409 6342 0345 0464	\$300 HH	0018 0019 0000 0011	.0368 .0367 .0356 .0356 .0442

¹ The stations' apparatus may be obtained from Error & Amend, Eighteenth Street and Third Avenue, New York:

difficulty being the quantity which is required to fout the instrument.

Microscopical Espaination.—The microscope may reveal the presence of fat globules, coloutrum corpuscles, blood, pus, epithelium, and granular matter. Colostrum corpuscles are abnormal after the twelfth day; pus and blood are always abnormal. The presence of any of these elements necessitates the suspension of nursing, at least temporarily. But little importance can be attached to the size and appearance of the fat globules as affecting the nutritive properties of the milk.

The Defermination of Fat.—The simplest method is by the treamgauge (Fig. 15, B). Its results are only approximate, but in most cases



Fig. 14.—Trans nos Decembra-180 una Fay un Mina. A., Balench's late for com's milk; B. Lewis modification for woman's milk.

sufficiently accurate for clinical purposes. The tube is filled to the zero mark with Iresh milk, which stands, corked, at room temperature for twenty-four hours, when the percentage of cream is read off. The ratio of this to the fat is approximately five to three; thus 5 per cent cream indicates 3 per cent fat, etc.

For an accurate determination the best ready method is the Babcock test, which requires 29 c.c. of milk, or the modification by Lewi¹ of the Leffman and Beam test for cow's milk. This requires special tubes.

Super.—The proportion of sugar varies so little that it may be ignored in clinical examinations.

Protein.—Climical methods for the estimation of the protein are not very satisfactory.³ We may also form some idea of the protein from a knowledge of the spe-

"The one giving the best moults is that in which the protein is precipitated by a solution of phosphocamptic and hydrochlaris node in the Esbach take, the

^{&#}x27;Lewi's method is no follows:

⁽¹⁾ Place in the null fluck 252 ex. of woman's milk measured in a special graduated pipetic; (2) carefully more the pipetic and add the name quantity of sulphune acid C. P. of specific gravity 1.830. The sold should be added slowly, and mixed with the milk by gently rotating the flack. The color turns to a very thick between from the condution of the sugar and protein; (3) new add 0.6 e.c. of a mixture of equal parts of fixed all and strong hydrochloric acid; (6) add sufficient of a mixture of the same sulphune acid and water, equal parts, to bring the level of the fluid well up into the neck of the flack; (5) centralings for three or four minutes. The percentage of fat is now read off, each one-tenth graduation in the neck of the flack representing 0.3 per cent of fat in the specimen of milk.

cific gravity and the percentage of fat, if we regard the sogar and salts as constant, or so nearly so as not to affect the specific gravity. We may thus determine whether it is greatly in excess so very low, which, after all, is the important thing. The specific gravity will then vary directly with the proportion of protein, and inversely with the proportion of fat, i. e., high protein, high specific gravity; high fat, low specific gravity. The application of this principle will be seen by reference to the accompanying table.

Warnen's Milk

	Specific gravity—22° T.	Cream-24 hours	Princip (intimated).
Average. Normal variations Normal variations Abs I variations		SU-12% SU-12% SU-40% High (above 16%) Low (below 5%) High Low	1.20% Normal (nich milk) Normal (tair milk) Normal or slightly below Very low (very pour milk Very high (very nich milk Normal (or nearly so)

A specimen taken for examination should be either the middle portion of the milk—i.e., after nursing two or three manutes—ar, better, the entire quantity from one breast. The first milk is slightly richer in protein and much pooper in fat. The last drawn from the breasts is lower in protein and much higher in fat. The following analyses from Forster illustrate these differences:

	First Portion.	Paris North	Third Person
Fat	Per cont. 1.71 1.13	Por cont 2.77 0.94	5.51 0.71

Conditions Affecting the Composition of Woman's Milk.—The Age of the Nurse,—This has no constant influence. Other things being equal, the milk of very young women, and also of those over thirty-free years of age, is likely to be lower in fat than that of women between twenty and thirty-five years.

Number of Pregameter.—Administ found that the average milk of 23 primiparse and 23 multiparse, both taken at the third mouth, showed the following differences: The milk of the primiparse averaged higher in fat and in protein, but a little lower in sugar.

Acute Illness.-In the unjectty of cases of acute illness of a minor character and of short duration there is no perceptible affect upon the

percentages being rend off after standing twenty-four house. For description see Boggs, Johns Hopkins' Hospital Bulletin, No. 187, Decount, 1906. milk. In the scute febrile diseases of a severe type the quantity of milk is reduced, the fat is low, and the protein is apt to be high. In septic conditions bacteria may appear in the milk.

Meastruction — The effect of this is exceedingly variable, depending much upon the individual and the case of menstruction. The most frequent changes noted are diminution in the quantity and a lower fat

with the protein sometimes increased.

From observations upon 685 cases, Meyer noted disturbances in the child in over one-half the number. Our own experience accords rather with that of Pfeiffer and Schhichter, who consider at quite exceptional for the child to be visibly affected. Schlichter made observations upon infants during 233 menetrual days, noting the condition of the stools and digestion both before and after menetruation. In ninety per cent of the cases there was no perceptible influence. In only eight per cent were the stools bad, and in only three per cent was there disturbance of the stomach with comitting. It is safe to my that the changes in milk accompanying menetruation are not uniform, and that in very many cases none of importance are produced.

Diet.—The composition of the milk is not so much influenced by diet as was formerly believed to be the case. The milk of an under-nourabled woman is likely to be peer both in fat and protein. Sufficient food causes an increase in these substances. It is doubtful if the amount of fat can be further influenced by feeding either fat or carbohydrate, though by some authors it has been claimed that this could be done. Diet has a similar influence upon the quantity of protein. The amount of sugar is nearly constant under almost all circumstances. It is probably true that when the quantity of protein and fat are high they may be somewhat reduced by exercise and taking less food, but not to a marked extent unless under-nourishment had been present. All fluids tend to increase the quantity of milk.

The nursing woman should have a generous diet of simple food, and should drink largely of stilk or gracks made with milk. The diet should be a varied one, not excessive in nitrogenous food nor in vegetables. Salade and highly assessed dishes absuid be avaided, not so much because they upon the child, although this may happen, as because they are likely to disturb the direction of the nurse. Nearly all the common vegetables and sweet fruits in season may be allowed in moderation. Strong ten and coffee should be probabled, although weak ten or coffee may be allowed, each but once a day. Cocon is not objectionable. In addition to her regular meals the nurse should have milk or graid at bedtime. The diet should as all cases be adapted to her digestion. The lowels should move daily, by the use of laxatives if necessary. Great larm often results from overfeeding with its consequent indigestion.

Afcoholic Reverages.—With many women the use of multed liquors ale, hear, etc.—increases the quantity of milk and the proportion of fat; but with many others their only effect is to fatten the nurse, often to a striking degree. The effect of spirits upon the quantity and composition of the milk is less marked, but along similar lines. Unless taken in large amounts by the mother, alcohol does not appear in her milk, and there is no sufficient ovidence that in usual amounts it has any deleterious effect upon the milk; but the general use by nursing women of alcoholic beverages in any form is to be condemned. There are in most cases much better means of improving the milk than by alc, here or whisky; they should be recommended by the physician to nursing women with the greatest discrimination. The danger of the formation of the alcoholic habit is too great to be passed over lightly.

Brugs.—The elimination of drugs through the milk is somewhat uncertain and variable; few of those popularly supposed to affect the child through the milk really do so. Given in full doses, beliadonna regularly appears in the milk. Opinin does not do so constantly; but when the milk is poor, enough may be excreted to produce serious symptoms. The todids and brounds when long administered may be eliminated in sufficient quantity to produce their constitutional effects in the child. Mercury does not appear regularly, but only after prolonged use, and thes in variable quantity. Most of the saline cuthurties, arsenic, and the sufficient to produce symptoms in the nursing child.

Pregnancy.—The milk of a nursing woman who has become pergnant is generally scanty and poor in quality, especially in fat. The milk of a woman suffering from the toxemia of pregnancy is toxic to her infant. Fatal consequences have not infrequently followed put-

ting an infant to the breast shortly after schamptic attacks in the mother.

Bacteria.—Under normal conditions woman's milk may contain a few bacteria. They are chiefly coses derived from the external milk ducts and are of no importance. In supparative inflammation of the manmary gland, numerous bacteria may be found in the milk; also in some cases of purposal separa. Tobercle bacidi have been demonstrated by Roger and Garnier in the milk of a woman with advanced inherculosis, but ordinarily they are not present unless the gland is the seat of the disease.

The Elimination of Astitoria and Other Protective Substances by the Milk.—The immunity of nursing satisfies to most of the contagous discases has long been noted, but until recently little understood. Annual experiments have demonstrated the constant presence of diphtheria autitoria in the milk of immunited anomals. The Widal reaction has been obtained with the milk of mothers suffering from typhoid and with the blood of their healthy nursing infants.

Nerrous Impressions.-The effect of the nervous condition of a woman upon her milk secretion is very striking, and much more important than the fliet. Both the quantity and the composition of the milk are markedly changed by many different nervous impressions. Fright, grief, passion, excessive sexual indulgence, or any great excitement may entirely arrest the secretion, or if not arrested the milk may be so altered in composition as to make the shild acutely ill. Werre, anxiety, fatigue, intense or prolonged nervous strain may so alter the milk as to cause it to disagree with a child who had previously thrived well upon it, or they may greatly dimensah and sometimes even arrest the secretion. It is the nervous condition of the mother more than anything else which determines her encoses or failure as a nurse. If a mother would name successfully, she must have plenty of rest and sleep, moderate exercise, keep her mind free from unnecessary worries, avoid social engagements, and lead a sample, regular, natural life. Unless she can and will do this excessful nursing can hardly be expected.

The nature of the changes produced in malk by nervous disturbances in the mother are in jet little understood. Some infants are so profoundly affected as to suggest the development of toxic substances in the milk. The milk of the tired and worried mother is nearly always low in fat, while the protein is usually high, and possibly there are other changes as yet unknown.

COWS MILK

Cow's milk being our main reliance in the artificial feeding of infants and the staple food of nearly all young children, it follows that everything relating to its production and handling is important. For fuller information than it is possible to give here the reader is referred to special works upon the subject.⁴

The essential conditions to be fulfilled in cow's milk which is to be used as a food for infants and young children are: (1) Freshness; (2) it should contain no preservatives; (3) it should be from healthy animals, free from tuberculous or other taint; (4) it should be clean; (5) it should not be skimmed or otherwise falsified; (6) it should con-

^{*}Convenient works for a physicism's are no Richmond's Duby Chemistry; Alkerian's Mills, Its Nature and Composition, Black, Lundon, Rassell's Outlines of Duby Bacteriology; Belifan's Clean Milk, Hardy Pablishing Co., New York; Permons' Jensen's Milk Hargarie; Milk and Its Relation to Public Health, Bulletin 56, U. S. Public Health and Marus-Hospital Service; The Milk Question, M. J. Resense

tain no pathogenic organisms; (7) the number of other organisms should not be excessive. It is also desirable for purposes of infant feeding that the composition of the milk, particularly the percentage of fat, should be known, and that the milk should be as nearly uniform as possible from day to day and at different seasons of the year. Mined or herd milk is therefore to be preferred to that from a single animal, since it is subject to fewer variations. The common varieties or "grade come" should be chosen rather than highly bred animals, if for no other reason, because they are more hardly, less subject to disease, and less susceptible to other influences which might affect the milk.

As ordinarily handled, male should if possible be used before it is twenty-four hours old; after this time changes occur very rapidly, and such milk can not in summer be used with safety for infants. Milk may be safe for a longer time provided special processions are taken in producing and handling it, and special care in keeping it constantly at a temperature below for F.

Preservatives are sometimes added, particularly in hot weather, by unarrapulous dealers to retard the souring of milk, in order thereby to avoid the necessity and expense of proper ising. Formerly borie or salicylic acid was, and recently formaldehyd has been largely employed for this purpose.

Microorganisms in Milk,-Most of the common bacteria grow readily in milk, and the conditions under which it is produced and handled

render it liable to contamination in many ways.

1. Disease in the Com-From disease of the other streptococci or other progenic germs may enter the nells in such numbers as to excite scute gastro-enteritie in a child, but the particular danger under such circumstances is "septic sore throat." Within the last few years several severe cuidenics of this dangerous disease have been reported. A number of these have been traced to hards that have included one or more animals with septic infection of the utilier. Other diseases which may be communicated from the cow are tuberculosis, anthrax, and the foot-andmouth disease. Veterinarians differ much in their estimates of the amount of tuberculous among cuttle, the estimates range from 3 to 25 per cent. It is the general opinion that it is on the increase, though this may only mean that the disease is now more often recognized. Of the cattle slaughtered in Landon, 23 per cent are stated to be inherculous. Unless the process is advanced or the udder is the seat of disease, tuberele bacilli are usually about from the milk. Nevertheless tuberele bacilli are frequently found in small numbers in ordinary market milk. In 197 unselected specimens of malk sold from cans in New York City, Hess found tubercle bacilli in 12, or 16 per cent. Rabinowitch and Kempner in 25 similar examinations in Berlin found tubercle bacilli in 7, or 28 per

cent. Macfadyen in Lendon found, in 27 samples of milk, tubercle bacillis present in 17, or 21 per cent. These figures may probably be taken to represent average conditions in large cities. But the dangers from milk are not quite so great as would appear from these findings, for in many of the cases the number of bacilli is very small and only discovered by animal inoculations.

For remons given elsewhere (rids Tubervulosis), we can not believe the danger of acquiring tuberculosis through rolls as great as many have represented; not make must be regarded as one of the sources of tuberculous infection. The sale of neith from cows showing exidence of tuberculosis upon physical examination, and from those having tuberculosis of the under should not be permitted; also the milk of every cow which reacts to the tuberculin test unless pasteurized.

2. Specific Pethogenic Organisms Acceleratelly Gaining Access to Milk.—The rôle of milk in the spread of infections disease may be appreciated by the fact that in 1900 Kober was able to find records of 330 sutbreaks which were traced to it. The disease most frequently communicated in this way is typhoid fever. In the reports of 192 epidemies collected, typhoid existed at the dairy in 148 instances; in 24 mass the employees acted as nurses to typhoid patients, and in 10 they continued at work, although themselves suffering from the disease.

Next to typical the disease most often spread through milk is scarlet fever. The sudden and simultaneous development of a considerable number of cases in a community should lead one to consider the milk supply as a possible cause. Of 92 spolemics of scarlet fever, there was disease at the farm or dairy in 68; in 17, employees were themselves affected, and in 10 they acted as nurses.

During 1911 and 1912 extensive epidemics of septic sere throat occurred in Baston, Chicago and Baltimore which were traced to streptococci aprend through milk.

Besides the diseases mentioned, diphtheria, chelera, dyembery, and certain forms of diarrheal diseases may be apread by milk.

3. Other Bacteria Found in Wills.—These are chiefly derived from the dust of the stable, the hands and clothing of the milker, and from the dirt which falls from the udder and telly of the cow into the pail during milking; very many come from the cow's exercts. Freeman expected a Petri gelatin-plate beneath a cow's udder for one minute during milking and obtained 4,450 solenies. The varieties of furteria found in fresh milk are many and vary with locality. Toward the souring point the great majority are of two or three varieties only; fully \$5 per cent at that time belong to the factic-acid-producing group. They came the ordinary souring of milk by acting upon the milk sugar. Colon bacilli are very common. Other bacteria act upon the milk protein,

inducing various putrefactive changes; and still others have a poptonizing power.

Many of the bacteria are harmless. Others, while not strictly pathogenic, jet when present in large numbers induce changes in milk that in ansceptible infants may cause serious illness. The relation of bacterial contamination of milk to infantile discribes is considered in the introductory chapter upon Discribeal Diseases.

The Number of Bacteria in Milk.—This depends upon three conditions: (1) Cleanliness in handling; (2) temperature; (3) age of the milk. Hence the bacterial scant becomes of value in furnishing information as to these matters, although of less importance in regard to the production of disease than the nature of the organisms present. The influence of temperature alone upon the multiplication of bacteria in milk is well shown by the following experiment: Four samples of the same milk were kept at different temperatures for twenty-four hours and equal quantities were then plated; No. I was kept at 60° E, and showed 184,340 colonies; No. II was kept at 55° F, and showed 67,170; No. III was kept at 50° F, and showed 1,361; No. IV was kept at 44° F, and showed 448.

The number of barteria in bottled milk from good single dairies usually ranges from 10,000 to 50,000 per e.em., according to the season. Milk from mixed dairies delivered in case usually ranges from 100,000 to 1,000,000, though much higher figures are often reached in very hot weather.

The number of bacteria in cream is nearly always greater than in milk. Freeman's experiments with gravity cream showed that the bacteria were 300 times as numerous in the cream as in the milk left bebind, the bacteria being apparently carried up with the fat globules. This emphasizes the necessity of the greatest care with reference to the use of cream.

A Bacteriological Standard for Pure Mills,—It is impossible and undesirable to fix a numerical bacteriological standard for pure milk. One milk commission requires that the milk shall not have more than 10,000 bacteria in such cubic centimeter; another fixes the limit at 30,000. A milk commission about insist that milk be produced from healthy anmals and under the most hygicule conditions, that it be handled only by healthy persons, and that every possible precaution be taken to exclude pathogenic germs. It is possible to lay too much stress upon the mere number of bacteria. There is no evidence that when the conditions mentioned have been fulfilled the results in infant feeding are better with a milk containing 5,000 bacteria or less, than with one containing 20,000. Nor is there any proof that milk containing 20,000 or 30,000 bacteria per corn, is for this reason alone injurious. A low bacterial count may is taken as presumptive stidence that the milk is preduced under hygions conditions and carolially handled, and in such circumstances the entrance of pathogenic germs is improbable. Such a milk is therefore preferable. While it is quite possible to produce milk which is pratically sterile, the expense cutaded is so great as to make the commercial production of such milk impracticable.

The Means of Excluding Pulsoyenic Bacteria, and of Checking the Spread of Contogious Diseases through Milk.—Bales are readily deducable from a study of the records of how milk has usually been infected.

- No person suffering from, or in contact with, a contagious disease should enter a dairy building or come in contact with the milk or milkutensils. Children, domestic animals, and, so far as possible, flies should be excluded from rooms where milk is handled.
- Milk should not be handled in or near dwellings, privies, or stables; cans and pails should be washed only at the dairy, and after ordinary cleanusing they should be beited or sterilized with live steam.
- 3. Duiries should be subject to regular city or state inspection. Milk from rows showing physical evidence of inherentons should be excluded; also that from unimals which are in any way seek or are suffering from disease of the nahr. Milk from apparently healthy animals which respend to the tuberculin test should not be used for food in a raw state.
- 4. During epidemics of scarlet or typhoid fover or septic sers throat no raw milk should be used; and all cases of such diseases occurring in the families of those who produce or handle the milk should be immediately reported and isolated by the authorities. Most of the rules mentioned are enforced by milk commissions which supervise the production of "certified milk."

Composition of Cow's Milk.—Except in the percentage of fat, the composition of mixed or herd milk does not vary greatly with the different breeds. The fat is lowest in the Helsteins, and highest in the Jerseys.

Composition of Com's Milk!

	Jersey	Halesdar	Anne Out
t. composition of the compositio	5,61 5,15 3,91 0,74 15,41 84,59	3.46 4.86 3.29 6.74 12.41 87.57	4.00 4.75 2.90 0.75 13.00 87.00
	100.00	100.00	100.00

[&]quot;In the table the figures for Jerns and Holstein herds are the averages given by the New York State Experiment Station. The requirements in New York and most of the States are, fat, at least 2 per cent; total salids, 12 per cent.

In a poor milk the only important difference to be considered in that the fat is from 0.5 to 1 per cent lower than the averages given. In Jersey wilk the chief difference is that the fat is 1 to 1.5 per cent higher than the averages; there is also an increase, though a less important one, in the other solids. As to the relative advantages of the different breeds for infant feeding, the difference does not seem great, provided all are equally healthy. Jerseys and all highly bred animals are more prone in disease and manor disturbances than the hardier common breeds.

The Examination of Cow's Malk.—The application of heat often causes congulation in malk which is near the souring point, and also in colostrum milk. Both are unfit for use. The normal reaction of cow's milk is amphotoric or slightly neid; if alkaline, it is pretty certain that something has been added to it.

The specific gravity is from 1.028 to 1.033. If the cream has been removed, the specific gravity is raised; if water has been added, the specific gravity is lowered.

The best of all ready methods of determining the fat content is the Rabceck test. The cream-gauge may be used as for woman's milk, the 100 c.c. size to be perferred; but it is not to be relied upon unless the milk is put into the cylinder soon after it is drawn and couled rapidly by being placed in ice-water. Under these conditions, if the reading is made after eight to twelve hours, the percentage of cream to that of fat is about three to one.

A microrespical engineation of the cream and the sediment may give valuable information. Not much can be learned from a study of the fat riobules, but among them may be found colostrum corpuscles, which are usually present for nearly a week after carring. The sediment after centrifuging should be examined to ascertain the number and character of the cells present and should be stained for bacteria. The character of the cells can best be determined by the use of a differential Hood stain. A few lencocytes are almost invariably found in normal milk; epithelial cells and lymphocytes may be present in quite large numbers without impairing the quality of the milk. However, commphile cells and polymorphonoclear neutrophiles, when in large numbers or in clumps, invariably indicate ducase in the cow and the milk should be rejected. Such milk is often ropy in consistency owing to the presence of mucus and usually contains many long chains of streptococci. When used for infants it may excite severs dipostive disturbances, usually diarrhea. Red blood cells in milk may be due to transmattern, to inflammation or to the fact that milk is taken too soon after calving. Whenever polymorphenucleur leurocytes, blood or streptocecci are at all numerous, the milk should not be used and a thorough inspection of

the herd should be made. The only sure way of demonstrating the presence of tubercle bacilli in milk is by animal insculation.

The ensein of cow's milk is readily congulated by remet and by acids. The curd formed by the gastric juice is tough and firm and is more slowly dissolved by the action of the digestive fluids. The case in of woman's milk is not regularly congulated by remet, and only slightly and with difficulty by acids. The curd formed by the gastric juice is loose and forculent, and is readily and completely dissolved.

The isorygonic soits in core's milk are about three and a half times as abundant as in woman's milk; but as will be seen in the following table, the proportion in which the principal salts are present is very nearly the same, the only notable exception being in the phosphoric arid.

	Cow's!	Warmin's
30	22.67%	23, 2%
MgO	27.4%	16.67
Sag	10.90	7.25

The large amount in one's mak is mainly derived from the casein. Even when diluted twice the chief salts of coar's milk are still in excess of those in woman's milk. In all dilutions of coar's milk the total salts may be calculated as one-dillit the proton. The ratio thus it about the same as salts to protein in woman's milk. The larger amount of total salts in mor's milk apparently has no injurious effect upon the digestion of healthy infants; most of the excess is not absorbed or retained. Thus while an infant fiel on woman's milk absorbs about 80 to 85 per cent of the salts in the milk and retains from 40 to 50 per cent, one led on cow's tolk absorbs only about 60 per cent and retains about 15 per cent.

The ash of milk, however, does not accurately represent its mineral constituents. About 8 per cent of the phospheric soid of the ash, according to Richmond, a derived from the casein; sulphuric arid, though traces are found in milk, a not to be regarded as one of its true mineral

[&]quot;By Habburton and some other characts the norm constages is given to this protein as it costs in milk. When this is acted upon by request it splits up into two substances: One, the firm, moduble congulars to which only the term cospic is applied; the other, a solidle protein which is known as interpretors; this is present in but small amount. Those who use the term cosm to doughate the protein as it exists in milk, refer to the conf. formed by the action of numericin the abounch as presented.

^{*}Average of four standard authorities.

^{*}Average of sinteen snabses of muture milk: Courtney and Pales.

constituents. The most recent analyses show the presence of citric acid to both woman's and cow's milk.

The amount of tree in milk is extremely small. In woman's milk it is about 1.5 nigm, per liter or 30005 per cent (Bahrdt and Eddstein). In cow's milk it is only about one-third this—really a negligible quantity.

Bacteria.—Cour's milk always contains a large number of bacteria which increase in proportion to the age of the milk; somen's milk is seldom quite sterile but contains a few corri from the milk ducts. To what degree the bacterial content of cour's milk affects its digretibility by healthy infants, it is impossible to make positive statements. There seems abundant clinical evidence that excessive bacterial contamination of the varieties commonly present in milk are detrimental even to healthy infants, and that to the delicate, the feeble and the discused their effects are most sujurious. So far as the production of discusse is concerned, it is of source the nature, not the number of bacteria which is important. The beneficial affects seen of sterilizing or bailing the milk fed to feeble children are only in part to be averabled to the destruction of bacteria.

Cream.—A great misapprelausion exists as to its composition. It is often spoken of as if it were something entirely different from milk. It should be regarded rather as milk which contains an excess of fat. Cream was formerly obtained by skimming—the gravity process; at present, almost entirely by the use of a centrifugal machine known as a separator. The latter process has the advantage in point of time, as centrifugal aream can be put upon the market from twenty-four to thirty-six hours earlier than gravity cream.

The following table gives the composition of an average milk and of centrifugal cream of different densities removed from the same milk:

				Cance.		
	34.6k	1.	11	m	W.	Ψ.
Fat. Segar. Protein. Salts.	4.00 4.70 3.30 9.75	\$ 00 4.00 3.40 0.70	12.00 8.30 3.30 0.65	16.00 4.15 3.20 0.60	20 III 3.90 3.66 0.55	40 00 1 00 2 20 0 45

The percentages of protein and sugar in the S and 12-per-cent cream are but little lower than in milk; in the tery rich creams they are reduced by about one-third.

It is unfortunate that no general standard exists as to what shall be seld as cream. In New York State the law provides that cream shall contain at least 18 per cent fat. Very rich, centrifugal cream has from 35 to 40 per cent fat; the usual centrifugal cream has about 18 to 20 per cent. Gravity cream has generally from 16 to 20 per cent fat.

None of the methods for determining the fat in milk is applicable to cream, except the Eabcock test. Such variation exists in the strength of cream that the physician who is prescribing it for infants should have tests frequently made.

Hethods of Obtaining Milk Containing Various Propertions of Pat
—Top-Milk, Skimmed Milk.—To secure a milk for infant feeding which
is fresh and at the same time one which contains a larger proportion of
fat than does whole milk, one may remove only a certain number of
tenness from the top of a quart bettle. If cow's milk is put into bettles
soon after it is drawn and rapidly cooled, the top-milk may be removed
after four hours. Milk bottled at dairies and then transported should
be allowed to stand after it is received for at least two hours before
removing the top-milk. This may be done with a siphon, spoon, or a
small special dipper; pouring off is not accurate.

Skimmed milk, or milk which contains a smaller proportion of fat than does whole milk, may be obtained from bottled milk by removing a certain number of ounces from the top of the quart bottle and using only the remainder.

It is unnecessary in practice to have a top-milk which contains more than 7 per cont far; while it is desirable at times to obtain milk which is practically fat-free. It is also desirable to know the percentage of fat that is obtained when one uses various quantities from the top or bottom of a quart of milk. These values are only approximate, but if the top-milk is carefully removed, are sufficiently accurate for practical purposes. These may be obtained from average herd milk or very rich milk as follows:

```
From one quirt 4 per cent milk

Upper 56 oz. has 7% fat; upper 20 oz.
24 5% all

All 4% rest after reserving top 2 oz. has 3% 8
```

Fat-free milk can be obtained only by the removal of the cream by a separator.

In general it is wise for one who has much to do with infant feeding to have his patients take milk from the same supply to secure uniformity in his results.

In or near large cities it is possible to obtain from milk laboratories cream or milk with any desired percentage of fat.

Milk Sterilization.—The term sferilization is widely and rather loosely used to signify the heating of milk for the destruction of germs.

It should, however, he borne in mind that none of the methods commonly employed renders milk sterile in the bacteriological sense of the word. What is a complished is the destruction of such pathogenic germs as may be present, and from 95 to 99 per cent of the other factoria, so as to retard for a considerable time the ordinary fermentative changes.

The advantages of sterilizing milk are obvious. When we consider the enermone number of bacteria present in cow's milk with the must methods of bandling, and that they are frequently the came of discuss, it is not strange that after its introduction by Socklet in 1886 the practice of beating milk used for infant feeding rapidly extended over the world. Following him, the earlier experiments in sterilization were made at 212° F., nemally continued for an hour and a half, and this temperature is still largely employed on the Continent of Europe. Even this does not render milk safe for very long. Spores are not destroyed, and at ordinary room temperatures spore-beating bacteria may soon develop in such numbers as to make the milk dangerous. Since some of these bacteria art upon the milk-protein and not upon the sugar, such milk may not be sour, and bears its danger may not be recognized.

There are some disadvantages in heating milk. The change in taste and the constipating effects of sterilized milk are very noticeable. Some of the lactose is converted into caramel, coming a slight change in color; the heatilbumin is partially congulated, this beginning at 160° F. (70° C.), and the case is rendered less congulable by rennet; Reitger has shown that when milk is heated above 185° F. (85° C.) a volutile sulphid is liberated, conclusive evidence of some change in the potein; the organic phosphorus is changed into an inorganic phosphote; the citric acid is partially precipitated as calcium eitrate, and some line salts, which are usually soluble, are converted into insoluble compounds. Some changes also occur in the fat. Moreover, certain natural ferments in fresh milk are destroyed by heat.

Many of these changes are doubtless without any injurious effect upon nutrition. There is, however, one important clinical reason for believing that the nutritive properties of milk may be impaired by heating to 212° F.—vie., the occurrence of scurvy in infants who are fed ablely upon such milk for a long time. Of 379 cases of infantile scurvy brought together in the Report of the American Poliatric Society, sterilized milk was the previous diet in 107. Many such cases have come under our own notice. Again and again cases of scurvy have been cured by simply changing from sherilized to raw milk.

Heating at Lower Temperatures—Pasteurizing Milk.—To obvious the disadisantages above referred to, the practice has come largely into use in America of employing much lower temperatures for milk sterilization. At present 150° to 151° F. (63° to 68° C.) are the temperatures generally employed. These temperatures are maintained from twenty to thirty minutes. This is sufficient to kall the bacilli of tuberculous, diphtheria, and typhoid fever, and from 98 to 99.8 per cent of all other bacteria in milk. Nearly all of the objectionable changes produced in sterilized milk are avoided when the temperature is raised only to 150° E. (65° C.), while it accomplishes the purpose for which milk is heated. The advantages of this form of beating are therefore obvious. But spons are not destroyed, and such milk requires special handling. It should be rapidly cooled, kept at a low temperature, and used within twenty-four hours after heating.

Commercial Pasteurization of Milk.—This was first accomplished by passing milk through hot pipes in which it was exposed to a temperature of 140° to 160° F. for a brief period, usually less than one minute. This has been found practically to be insufficient to destroy the pathogenic arganisms in milk. At present the method followed is known as the "holding process." By this the milk is slawly passed through a encession of rate being held at a temperature of about 150° F. for thirty or forty minutes. It is afterwards cooled, then drawn into sterilized containers, bottled and labeled "pastesvised" milk. For this process expensive and complicated apparatus is necessary and even when hope on a large scale it adds to the cost of the milk. The limited control which it is possible for a municipality to exercise over milk producers and distributors, the impossibility of securing adequate inspection of duity-farms and creameries, a contletion that a large part of the typhool seen in cities and towns is milk-horns, and the occurrence of extensive epidemics of septic sore throat from milk infection, have forced upon many boards of health the accessity of compelling pastenrization of all milk med for fool in an uncroked state unless the same is from "certified dairies" supervised by competent milk commissions. This practice bids fair to become general. The objections to and disadvantages of pasteurized milk should also be considered. There is a temptation to an umcrupatous producer to neglect precantions necessary to keep milk-clean, and at the same time to a dealer to deliver milk that otherwise would be unushable because near the souring point. The necessity of keeping pasteurized milk cold and of using it within twenty-four hours if possible, must be taught the public. The label "posteurized milk" too often conveys a false sense of security and leads to the neglect of the precautions mentioned. The date of pastearization should be stamped upon the label. It should be known that, unless wilk is kept cold and used men it may, even though pasteurized, contain an immense number of lucteria although it does not turn sour. The closest kind of supervision should be exercised by authorities which

permit or require the general pasteunization of the milk of a community.

Pasteurination vs. Sterilization.—From what has already been said it would appear that the argument is altogether in favor of pasteurination. The lowest temperature and the abortest time that will surely destroy the objectionable bacteria in milk would seem to merit general adoption. Pasteurination, however, requires considerable care, intelligence, and special apparatus. When all these can be secured it should be employed as the method of choice.

Sterilization at \$112° F. (100° C.) Is much simpler; it can be done with many simple and inexpensive forms of apparatus or even without any special apparatus. Where no ice is available, it is safer in hot weather than postcornation. Among the poor of our large cities, in summer, holling is to be advised as the most satisfactory, and indeed the only efficient, method of sterilization. It should not be forgotton that the use of such milk as the sole diet for a long time is attended with a certain amount of risk, even though a small one; and one should always be on the watch for the screeness of the large and the spongy gums that indicate the Leginning of scurvy. Heating to \$12° F, on two successive days is also to be recommended where milk must be kept for one or two weeks, as upon ocean journeys.

Methods of Heating Milk.—Milk for infant feeding should be sterilized at home preferably in small bottles, each one of which contains a sufficient quantity for one feeding. These bottles may be plugged with cotton or corks, or special stoppers may be used. Souther's apparatus may be employed, or Arnold's, or any one of a half dozen others sold in the shops. All that is really necessary is to expose the bottles on all sides to live steam in a closely fitting cover and a perforated bottom, and which can be placed over a pot of boiling water. Sterilination at \$12° F, is usually continued for one hour. The bottles should then be cooked in water as quickly as possible and placed upon ice or in the cooket place available.

A simple apparatus for pasteurising milk has been derived by Freeman in which the temperature is raised to 130° F. (65° C.) by hot water. An essential step in pasteurising milk is rapid cooling. After

[&]quot;Milk may be effectively, but not very accurately, passessized in the Loose without any apparatus in the following manner: Place the bottles of milk in a covered pot containing enough topol unter to cover the bottles to the neck. Allow this to stand on the top of a stove until the water begins to simmer. Now remove the pot from the stove to a table and let it stand for twenty manutes covered. Then cool the bottles of milk by placing them first in water at mean temperature and oftenwards in ice water.

thirty minutes the bottles should be removed from the pasteurizer, placed in water at the room temperature and afterward in ice-water, where they should remain half an hour before being placed in the cold room or ice chest.

The sterilization of milk is useful, first, for the destruction of pathogenic germs; secondly, for the destruction of the bacteria causing fermentation, thus enabling one to feed with safety milk in which, though it may be forty-eight hours old, no important fermentative changes have occurred. As a therapeutic measure sterilized milk is useful in various forms of gastric or intestinal infection such as typhoid fever, dysentery, distribute, etc. It is a matter of clinical observation that sterilized milk is sometimes well borne when raw milk is not, particularly by very young infants.

Shall All Milk Used for Infant Feeding Be Sterilized!—In warms weather only the very cleanest milk can safely be used without heating. In winter, the heating of milk is not so necessary; but so long as milk is produced and handled as the bulk of milk is at present, not being delivered in large cities until it is considerably over twenty-four hours old, and not consumed until over forty-eight hours old, some form of heating should invariably be practiced, unless it is known to be produced and handled under the best conditions. In the country where milk is obtained fresh and used before it is twenty-four hours old, sterilizing is unnecessary if the cows are healthy and the milk properly handled.

It is quite possible to produce milk which does not need sterilization. There are special duries supplying such certified milk to many of our large cities, and their number may be very greatly increased if the medical profession will use its influence in this direction. Our preference for infant feeding is a milk so clean and fresh that it may be safely given even in summer without heating, but this is at present available only for the small minority. Healthy infants with good digestion usually do well upon raw milk even though the number of bacteria is quite large; while delicate infants or those with digestive disturbances may be seriously affected by such milk.

The feeding of boiled or sterilized milk must be considered quite apart from the question of microdepanisms. There are unquestionably some very young and some delicate infants with feelle digestion who thrive better upon heated them raw milk even though the number of barteria in the latter may be very small. Experiments in feeding raw and beiled milk to young animals for comparative results have not been numerous, nor quite conclusive. These which have been published in Europe are rather in favor of boiled milk. The latest experiments of Daniels and Stossey in this country, however, indicate that animals do

not thrive for a long period upon boiled milk; although for the first two
or three months those fed on boiled milk did distinctly better than those
fed upon raw milk. Breammann (Chicago) has made some experiments
upon the human subject (a young adult) which show coordinately that
beiling has a marked effect upon the congulation of the casein in the
stomach. Under certain conditions this seems to produce a distinctly
beneficial effect upon digestion. However, this is far from proving that
all milk used for infant feeding shall be so heated. The use of
boiled milk for long periods is not to be recommended; although with
young infants and for short periods it is frequently of the greatest
service.

Protes. Milk.—During very cold weather milk is often unavoidably delivered in a partially or completely frozen condition and the question frequently is raised whether any important change is produced by freezing which affects its digostitelity by young infants. So far as is known the changes brought about are purely physical coes. Only the water of the milk freezes, the fat undergoing separation in consequence. When such milk is warmed again, the fat globules may coalesce to form an any layer of butter fat. While older children or robust infants are seldom affected by such milk, considerable disturbance may be produced in delicate or susceptible infants. Occasionally vomiting is excited, but more often there is diarrhea which may become severe. The higher the fat percentage in the milk fed, the more severe are the symptoms likely to be.

Peptonized Milk.—Milk is peptonized through the agency of a substance derived from the pancreas, usually that of the pig. This is known in the market as "extractum pancreatis," the active ferment being the trypoin. As this acts only in an alkaline medium, hierarbonate of soda should first be added to the milk. The purpose of peptonizing is to secure a partial digestion of the protein of milk before feeding.

Milk which has been peptonized ten minutes is not altered in taste; if, however, the process is continued for twenty minutes, a slightly hitter taste is noticed which increases with the duration of the process. Peptonizing may be arrested at any stage by raising the milk to the boiling point; but if the milk is to be fed at once this is not necessary.

Peptonized milk is useful only when the stemach is so sensitive as to be affected by the congulation of milk, something which is rarely seen. The prolonged use of peptonized milk as the sole food is sometimes follawed by senrys.

Condensed Milk.—This is prepared by heating fresh cow's milk to 212° P. for twenty minutes for sterilization, and then evaporating in turns, so that one part of condensed milk represents about two and a half parts of the original milk. Sweetened condensed milk is preserved in the came, with the addition of about seven ounces of came sugar to a pint.

The composition of sweetened condensed milk is shown in the following table; also the results obtained when it is diluted;

	Contrard Min/	With C Party of Water Added.	Wish III Parts of Water.	Parts of Water
Part.	Per mat.	Brout.	Per cent.	To cont.
	9-51	1:37	U.78	0.30
	8-01	1:14	0.61	0.42
Sugar Cane, 42.91	34.94	7.80	4.75	2.90
Salts.	1.78	0.25	0.11	96.00
Water	25.66	89.35	94.28	

⁴ Analysis of Borden's Engle-Brand condensed milk.

The reasons both for the success and for the failure of sweetened condensed milk as an infant-food are apparent from a study of its composition. As a temporary fixed it is aften sueful, first because it is nearly sternic, but chiefly because the fat of cow's milk has been reduced by the soul dilution to a point at which an infant with a very weak digestion can bear it, while it furnishes an abundance of sugar; but it is low in protein. Infants fed upon condensed milk are often fat, but have, as a rule, feeble resistance when attacked by scate disease, especially of the intestinal tract. It is rare to see a child reared on condensed milk who does not show some evidence of rickets. The prolonged use of somdensed milk is sensetimes a cause of scorry. Condensed milk is admiss sible for temporary use during attacks of indigestion, for infants with feelds digestion, especially in summer, for very young infants during the first two or three months, or among the very poor, when the cow's milk which is available is still more objectionalds. It should not be used as a permanent food when good, fresh cow's milk can be obtained. In travelling it is often the most convenient as well as the safest food to use. It should usually be diluted ten to twelve tones for an infant under one month, and from six to len times for those who are older.

During recent years condensed milk without my addition of sugar is sold in the market; in many large cities this is delivered fresh daily in bulk; it is also sold in tim runs in a sterilized form. To distinguish it from other condensed milk it is called "evaporated milk." Its strength is about the same as that of the better known condensed milk, i.e., one part representing about two and a half parts of the original milk, without any addition of sugar or other preservative. Evaporated milk requires the same modification as ordinary cow's malk. For routine use it should be diluted with from eight to twelve parts of water, and sugar added. When diluted with water the proportion of fat and protein will be approximately the same as in condensed milk given in the foregoing table. Additional carbohydrates may be introduced in whatever form may seem desirable, either as sugar (milk sugar, cane sugar, or mallose) or as starch (barley, out or wheat flour). It is a sterile, cooked milk. Some children thrive upon it who cannot so well digest either raw milk of the same percentage composition or even freshly pusturized milk. It should not be long continued as the sole food when good fresh milk can be obtained.

Dried Milk .- Dried milk is sold under various names and prepared either from whole milk or from skimmed milk. One process employed is that of sprusing the milk upon revolving white hot cylinders, the water being driven of instantaneously. In another, the milk is sprayed into a heated chamber through which but air is forced, the dried milk falling to the floor of the chamber as a powder. This latter process seems less likely to affect the fat and sugar. Dried milk as a yellowish-white powder, practically sterile; made from fat-free milk it keeps in closed cans indefinitely; made from whole milk it keeps for several months but after a time becomes rancid. When one part by weight is added to mire parts of water it approximates in composition the original milk. The preparations usually most satisfactory are those made from partially skimmed milk to which so whiltion of sugar has been made; if desired, sugar in any form or amount can be added. The uses of dried milk in unfaut feeding are similar to those of condensed milk, over which in many conditions it possesses advantages. It is not to be advised for prolonged use when good fresh milk can be obtained.

Buttermilk and Other Porms of Permented Milk.—Various forms of formented unit are in use which differ according to the milk used and the process followed. They resemble each other in that the fermentation is excited by some of the varieties of factic acid organisms, in some cases with the addition of yeast, which ferment a portion of the milk sugar. The ordinary buttermilk of commerce is sometimes made from sweet, but usually from sour cream. If from the latter, it resembles the fermented milks in that it contains hittle or no fat but a certain amount of factic acid, the result of fermentation. It defers from them in that the fermentation in buttermilk is due to a great variety of factic acid organisms; besides, it contains many other forms of bacteria than those concerned in the process of fermentation. Buttermilk should be made with care or it may be grossly contaminated. It, therefore, varies greatly in taste and considerably in composition under different conditions. The following is an average of many analyses.

Buttermilk

Felymout and a second s	0.50	per e	nect
Milk sugar, and a second second second second	4.00		0
Lactic seid	0.50		2
Protein. Inorganic salts.	0.75		4
Water.	1200	*	*
	100.00		

When used as an infant food it is sometimes sterilized and sometimes not. The segar content is raised by the addition of milk segar or cane segar; semetimes also barley flour or other farmaccous food is added. A formula much used is: buttermilk, one quart; barley flour, two even tablespoonfuls, water, four owners; cook slowly, constantly stirring, for twenty minutes; then add two tenspoonfuls of care sugar. The advantages of buttermilk as an infant food are chiefly due to its low fat content and to the small amount of factic acid which it contains. Its cheapness is an important consideration and makes it available for the very poor.

Other fermented milks, semetimes called buttermilk, are known also as factic acid milk, Jactobacilline, tactobacilliny milk, lactors buttermilk. etc. They are sometimes made from whole milk but chiefly from skimmed milk. This is usually first sterilized and then the ferment added in the form of a tablet, mixture or culture from some previously fermented milk. The ferment consists of different varieties of factic acid organisms; the one most frequently employed is known as the Bulgaricus. The product resembles ordinary buttermilk in its composition except that it usually has a higher acidity. It is a purer product since the fermentation takes place from one or two selected varieties of organisms and not from a great number as in ordinary buttermilk. It differs according to the exact varieties or combinations used, also according to the temperature maintained and the duration of the fermentation. A temperature of 80° to 85° F, is usually employed and this is continued from six to twelve hours according to the degree of acousty desired. The milk is then bottled and put on ice, where a slight change continues, although the milk alters but little for several days. The taste is rather pleasant unless the acidity is too prensumeed. It should not contain alcohol or acetic acid. These fermented milks are sometimes used in acute disease, but chiefly in chronic intestinal conditions after the first year. They are not adapted to continuous use in infant feeding.

Kneeper has been made by the Tartars for conturies from mare's mile.

It is made in this country from com's milk, sometimes skimmed, but countly from the whole milk. The fermentation is generally started with yeast and is continued in corked buttles usually for several days, with

frequent agitation. Kumyes centains carbon diexid, lactic acid, alcohol and traces of butyric and acetic acids. The acidity and the taste depend upon the duration of the process.

Zoalak or matroom is mule from whole milk which is first sterilized and then has added to it a ferment which contains some form of yeast. It differs from kurnyss chiefly in that the process is earried on in open vessels and the carbon disord allowed to escape. It is a thick smooth isquid and has a taste resembling that of sour cream.

Both kunyss and notak are better adapted for use with older children than with infants; they are chiefly valuable in cases of chronic intestinal indigestion. For infants they should be diluted with water and often given with a speen since they are too thick to go through the ordinary aspide.

Pretein Milk (Eiseus-Milch of Finkelstein).—In this milk modification is secured a mixture low in sugar with a moderate fat and a high protein. It must be carefully prepared to secure a uniform product. The average composition when made as directed below is fat 3.0 to 3.5 per cent; sugar 1.8 per cent; protein 3.75 per cent; salts 0.65 per cent. Its caloric value is about 15 to the source. The fat percentage varies considerably according to that of the fat of the milk used and the care exercised in its preparation. When less fat is desired partially skimmed milk may be substituted. The proportion of the ingredients other than the fat is pretty uniform. The total salts are a little lower than in whole milk; the proportion of insoluble salts, especially calcium, is, however, greater, while that of the soluble salts of solium and potassium is somewhat less. Protein milk has a slightly sour, rather insipid taste, so that its administration to some infants is difficult. It is made

[&]quot;To one quart of whole sidk warmed to about 100" F. one-half orner of liquid respet or better one junkes tables shoolved in water is added, stirring for a moment only, after standing at recon temperature for turnty or thirty minutes, or until it is firmly congulated, it is poured igon two layers of gause or chemedoth and suspended for about one hour to drain off the whey. The gurd is then washed twice with cold boiled water, after which the dry cond is rubbed through a very fine neve with a vegetable nusher, or some similar instrument, with the gradual addition of one pint of buttermilk. Enough helical water is added to make one quart. When needed in quantity for hospital use, from five to ten quarts may readly be prepared at one time. After congulation it is poured upon the cheesecloth and allowed to durin undisturbed for ten to fifteen minutes. The card is then rolled from side to side by miniguisting the threeseloth and the whey removed in a few manutes. It should then be washed. Protein milk, made at above described, will contain the greater part of the fat, casein and insolable salts of the original milk, also the salts, sugar and protein of the butterrolls, which makes up half its volume. The sugar, the albumin, the soluble salts and a little of the fat are removed wells the wher and the wash.

more palatable by the addition of one grain of saccharine to the quart.

The advantages of protein milk depend upon: (1) its low sugar; (2) its relatively high fat and unsoluble salts whose soups favor the production of formed stools and check intestinal formentation; (3) the high protein (nearly all casein), which, having been precipitated and then mechanically subdivided, is well forme by the stomach; (4) probably to some degree the lactic acid organisms contained in the butternilk. The high percentage of casein is readily held in suspension. When properly made protein milk is smooth and homogeneous and readily passes through an ordinary rubber nipple. It can be warmed to the usual temperature before feeding, but if heated much above this point the card separates. Protein milk is to be regarded as a therapeutic agent, not as an infant fixed for prolonged use. It has a wide field of usefulness in both acute and chronic disturbances of digretion with intolerance of carbohydrates, particularly those associated with distribute.

Junket or Curds and Whey.—Junket is made as follows: To one pint of fresh lukewarm cow's milk are added two tresposatule of essence of popsin, liquid rennet, or half a junket tablet. It is stirred for a moment and then allowed to stand at the room temperature until firmly congulated. Junket is useful in the feeding of older children, but should not be given to infants.

Whey,—The milk is congulated with remost as above, the curd is then broken up, and the whey strained through muslim by suspension. The composition of whey varies somewhat, depending upon the way in which it is prepared. If it is desired to have as little fat as possible, eximmed or fat-free milk should be used, and the whey should be strained through fine muslin without pressure. If it is desired to retain some of the fat, whole milk may be used, cheesecloth as a strainer, and more pressure. The protein of whey is chiefly lactalbumin.

Whey is useful for infants with gastric symptoms when low fat is desired. Its high sugar and salt content usually contraindicate its use in cases with intestinal symptoms, especially if diarrhea is present.

Whey

	Manager M Analyses Rooms	From Whole Milk (hdrisnes).	Process State (Address of)		
Protein. Far. Sagar. Salta Water.	0,86 0.33 4.79 0,65 93.38	0.94 0.96 1.49 0.48 92.13	1,17 0.04 5.36 0.92 92,94		
Total	100:00	100.00	100,00		

Wine whey is made by adding sherry wine to whey, in the proportion of one part to four of whey, possibly better by using the wine to congulate the milk. The wine (cooking sherry preferred) is added to the milk and the mixture shorty brought to the beiling point, then cooled and stramed.

Curd.—This contains little but fat and casein and is a useful form of food in many conditions, particularly in diarrhea. With the addition of a little salt it is not unpulatable. In chronic intestinal indigestion when there is intelerance of both fat and carbohydrate, curd may be made from skimmed milk.

BEEF PREPARATIONS

The nutrient value of these preparations is to be measured by the amount of albumin they contain—their stimulant properties by the proportion of extractions.

Beef Juice — Expressed beef juice is made as follows: A piece of round steak is slightly trailed, and the juice pressed out by a meat-press or a lemon-squeezer. Two or three owness can ordinarily be obtained from one pound of steak. This is seasoned with salt and given cold or warm, but not heated sufficiently to coagulate the allumin in solution.

An excellent method of making beef juice without cooking is by taking one journd of finely rhopped lean beef and right owners of water and allowing this to stand in a covered jar upon ice from six to twelve lasurs. The meat is then squeezed by twisting in coarse muslin. It is seasoned with salt and given as above.

Beef extracts are not to be considered in any sense as foods. Kemmerich has shown that animals receiving nothing also died of starvation, and some even than when everything was withheld. They contain no nitrogen in the form of protein, but only in combination with the soluble extractives. They are stimulants, but as such are soldom required.

Meat.—Bare scraped beef is easily digested by most young children. There are many conditions in which other forms of protein are not well borne, where children even as young as twelve months appear to digest this beef-pulp without difficulty. It should be made from very rare or raw steak, finely arraped and well salted. A tablespoonful may be given at one feeding to a child of eighteen months. In nutrient properties this far exceeds the beef preparations in the market. The alleged danger of tapeworm from the use of rare scraped beef or beef juice is in this country so slight that it may be disregarded.

Broths —Animal broths may be made from mutton, veal, chicken, or beef. A good formula for general use is the following. One pound of lean meat, one pent of water; let stand for two bours, then cook over a slow fire for two hours down to half a pint. After it has cooled, skim off the fat and strain through a cloth. The composition of a broth so made is given by Cheadle as follows:

Bee		- 43	-	т.
23164	er:	100	$_{\rm ro}$	LN:
	~		m (80)	

Victoria	1.02
Proposition of the second	 The state of the s
Fat.	 0.00
	 0.88
	100.00

From their composition it will be seen that broths contain very little nutritive material. They are stimulating and they furnish an excellent areans of adding inorganic salts to the diet in the latter part of the first year. Vegetables and barley, rice or wheat flour may be cooked with the broth.

Albumin Water.—This is prepared as follows: The white of one fresh egg is mixed with a pint of cold water, a little selt, and a teaspoonful of brandy added. It should be given cold. The nutritive value of this preparation, it should be borne in mind, is very small.

CEREALS.

Barley Water.—This may be used either from the grains or from the barley flour. When the grains are used, the following is the formula which we have been accustomed to employ: To two tablespoonfuls of pearl barley, add one quart of water and a punch of salt, and built continuously for six hours, keeping the quantity up to a quart by the addition of water; strain through course muslin. It is an advantage to sook the barley for a few hours before cooking. The water in which it is sooked is not used. When cold this preparation makes a rather thin jelly. Its composition by analysis is as follows:

Barley Water

Starok	1.63
Protein	0.700
Impreganie Salta	0.63
Water	98,20
	100.00

An almost identical product may be obtained in an easier way by using barby floor, one even tablespectaful to each factor enters of scater, and cooking for twenty minutes. A thirder jelly when desired can be made by using twice as much of the suriey.

Rice, Wheat, or Oatmeal Water, etc.—These may be made in the same manner as the burley water, using the same proportions either of the flour or the grains. These are useful as additions to milk for healthy infants who have reached the age of five or six months; they may also be given in many cases of acute or chronic indiportion when milk must be omitted or given in small quantities. When there is a tendency to constipation satureal is preferred; when to losseness, burley, whent, or rice water.

INFANT FOODS

It is not possible, nor even desirable, for a physician to know all about the infant foods with which the market is flooded. He should, however, know at least that they are not perfect substitutes for broad-milk, that as permanent foods they are greatly inferior to properly modified cow's milk, and that they are capable of doing and have done much positive harm. Scurvy has so frequently followed their prolonged use, when given without the addition of fresh milk, and constinues even when they have been given with it, that there can be no escaping the conclusion that they were the active cause. Their general use is condemned with practical manimity by authorities on infant feeding. Yet by industrious and skilful advertising they are forced upon public attention, and are extensively used by the laity and even by the medical profession. They are expensive. They add lattle or nothing to our resources in infant distories; in fact, they fend to retard rather than advance our knowledge of this subject.

There are, however, a few occasions when some of these preparations may be useful as temporary expedients or when nothing better can be obtained. They should be used only with a very definite knowledge of exactly what they do and what they do not contain. Their name is legion; but those most commonly employed in this country may be grouped as follows:

- 1. The Milk Foods.—Nextle's food is perhaps the most widely known. The others closely resembling it in composition are the Anglo-Swiss, the France-Swiss, the American-Swiss, and Gerber's food. These foods are essentially sweetened rendensed milk evaporated to dryness, with the addition of some form of from which has been destricted; they all contain a considerable proportion of unchanged starch.
- The Liebig or Malted Foods.—Mellin's food may be taken as a type of the class. Others which resemble it more or less closely are Liebig's, Horlick's malted milk, and coreal milk. Mellin's food as com-

pased principally (80 per cent) of solutio corlobydrates. They are derived from malted wheat and barley thour, and are composed chiefly of a mixture of dectrins, destrose, and maltess,

- 3. The Farinaceous Foods.—These are imperial gramum, Bidge's food, Huddell's prepared wheal, and Bobinson's patent harley. The first consists of wheat flour previously prepared by baking, by which a small proportion of the starch—from one to six per cent—has been converted into sugar. In chemical composition these four foods are very similar, consisting mainly of unchanged starch which forms from accenty-five to eighty per cent of their solid constituents.
- 4. Miscellaneous Foods.—Under this head may be mentioned Carurack's soluble food and Eskay's food. The composition of these is given in the following table;

Composition of Infant-Fonds !

	York's Trod	Mellig's Tools	Uskin's Food	Malani Mila	Total	Imperial greeners	Corneich' food.
4.	In our	Personal	Per real.	Total and	Drives	Percus	Per cont
Fat.	5:30	10.24	1.10	5 75	1.15	1.04	7.40
Pentent,	14.34	11.50	5.82	14.35	11.81	14.00	19,25
Cane sugar	25.00	10000	10000		STORY OF	Marrie .	30000
Destroie	3.00		23:461	100000	0.52	3 42	-0.244
Lactow [milk signs]	6:57	75000	100.00	49.15	-1.17	-0.00	3.17.45
Maltose	27 34	19 20	APRIL .	1000000	BARRET.	22.245	113.43
Destring.	100	19:20	34.35	18:80	1.25	1,38	177
Total Soluble earlie-		100090		1000000	150-501	115540	17900
bpdrates.	78.91	SU.00	57:81	67.95	1.50	1.80	27 08
Issolutie carboire-		1	120000		1996.00	120000	1300
drates (Snarsh)	15, 29	STREET,	21.21	121.01	76,21	73.54	37, 37
Inorganic salts	2.01	3.33	1.30	3.80	05,459	(5.329)	4742
Modetagne	2.81	4.73	2.70	3.05	8 58	9.23	3.42

^{&#}x27; 0, ith the exception of Newtle's tood and Carariel's soluble food, these analyses were made for the authors by E. E. Smith, Ph.D., M.D., of samples purchased in the open market.

1 Chiefly lactors

1 Largely multice.

The essential feature of all infant foods is that they are composed principally of surbshydrates and are lacking in fat. Some of them contain a large proportion of unchanged stands. Furthermore, their protein, through often sufficient in amount, is chiefly sugitable, not animal protein. No one of them can be regarded in any sense as a proper substitute for breast-milk.

Some of these foods—Nestle's and other milk foods, malted milk, cereal milk, and Carmrick's food, and even some of the farmaceous foods like imperial gramum—are advertised as substitutes for breast-milk and recommended for use alone. Others, such as Mellin's, Liebig's, and Eskay's books, are intended to be used with malk. The use of any of the

commercial foods alone is admissible only for short periods during derangements of digestion, when we wish to withhold for the time all milk fat. Their prolonged use almost invariably produces some grave disorder of natrition, most frequently sourcy. Those foods which require in their preparation the addition of milk are open to less serious objections, but are not necessary or even desirable. They should never be used with condensed milk. When added to fresh milk they may furnish the additional carbohydrates required by an infant fed upon a diluted new's milk. In such a case they take the place of milk sugar or case sogar in the milk modification. There is no proof to sustain the claim that they increase the digestibility of new's milk. Farinaceous foods may be used as an addition to milk after the sexth or seventh month and during the second year.

CHAPTER HE

INFANT FEEDING

CHOICE OF METHODS OF PERDING

Tun different methods of feeding which are available are:

- 1. Breast-feeding, either by the mother or by a wet-nurse.
- 2. Mixed feeding, or a combination of nursing and artificial feeding.
- 3. Artificial feeding exclusively.

In deciding by which one of these methods a child shall be fed, many circumstances must be taken into consideration: the vigor of the child, the health of the methor, and especially the surroundings, since those determine very largely the success or failure of any method employed.

Maternal Nursing.—This is the natural and the ideal method of infant feeding. Every mether should nurse her infant unless there are some very weighty reasons to the contrary. The physician should do all in his power to encourage maternal nursing and to promote its success. He should explain to the mother how important breast-milk is for the child; that fully four-lifths of the deaths under one year are in infants who are artificially fed. He should also make clear the conditions by which alone successful nursing can be accomplished; vin, proper dist, regular habits of sleep and exercise, and a simple life, in so far as possible free from causes of nervous excitement, futigue, overwork, or worry. Social engagements should be avoided. Much can be done by patience and persistence even in the face of many discouraging circumstances. Nursing may be furthered by proper care of the nipples before delivery, and by attention to them during the early days of nursing to

prevent fistures and mostitis, which often interrupt successful nurs-

As a result of extensive propagands the number of mothers of all classes of society who haves their different in the United States has beyond question materially increased during the last ten years. This is a hopeful sign. Among the poor and ignorant where artificial feeding is not likely to be well done, all possible efforts should be made to increase material nursing as the most effective means of reducing infant mortality.

When Maternal Narring Should not be Attempted .- (1) No mother who is the subject of inherenkess in any form, whether latent or active, should nurse bet infant; it can only basten the progress of the disease in herself, while at the same time it exposes the infant to the danger of infection. (2) Nursing should seldon by allowed when serious complications have been connected with parturition, such as ereere bemorrhage, puerperal convolsions, nephritis, or puerperal sopticemia. After severe hemorrhage and even after sepsis, women may necessar so as to nurse successfully. There is great danger to the child in nursing after eclampsia; even when put to the breast two or three days after the mother's last attack, fatal contributions have followed: (3) If the mother is suf-Jering Insm any serious chronic disease or is very delicate, since great harm may be done to her without any corresponding benefit to the child. With reference to the last-neutroned condition, an absolute coinion can not always be given at the outset. As a rate, mothers are more likely to succeed in nursing first or accord children than subsequent. ones. One should not be too ready to decide that there will be no milk, but should persist in stimulating the breasts by suckling the child. The milk may be delayed until the tenth or bredfth day, and yet come in such abandance that nursing may be successfully earned on for many months. In general the capacity for lactation diminishes with each successive programmy.

Artificial Feeding vs. Wet-Nursing.—When maternal nursing is impossible or undescrable, the milk of another woman would seem to be the most natural and best substitute. While this is theoretically true, the practical obstacles are so many as to put wet-nursing out of the question as a general method of feeding. We have in America no peasant class like that of Europe to draw upon; and in the class which furnishes most of our wet-surses the capacity to nurse has steadily diminished. The expense of a wet-nurse—therety to forty dollars a month in New York—the damper of transmitting contagious disease, and the difficulty of obtaining grapes care for his own infant, are all very serious objections to wet-nursing. The recent advances in artificial feeding have placed it now on quite a different feeting from that which it formsely

occupied. While it is true that good breast-milk is unquestionably the best food, it is equally true that properly modified mer's milk is a far better food than the milk of many wet-nurses who are employed. These facts added to the constantly increasing difficulty of obtaining good wetnurses have caused wet-nurses to be pretty generally discarded, even in our large cities, where formerly no other substitute for maternal nursing was considered.

There are, however, some conditions in which wel-mires are necessary, even indispersable. Some infants, usually these who have been badly started, can not be made to thrive upon any form of artificial feeding. There are also premature infants and other very delicate ones whose powers of assimilation are so feedle that they are reared in any circumstances only with the greatest difficulty, but whose chances of life are much increased by a good wet-nurse. Again, in young infants who have been unformed for some time from chronic indigestion and failing nutrition, the symptoms of arute inanition sensetimes develop with great rapidity and severity. From such a condition, apparently hopeless, infants may sometimes be rescued by the timely assistance of a good wet-nurse.

The difficulties in the way of successful infant feeding in hospitals, foundling asylums and other institutions for young infants are such that in them partial wet-aursong should be employed whenever possible, at least long enough to give the milant a good start.

Mixed Feeding.—Mixed feeding, or a combination of nursing and artificial feeding, may be employed whenever the supply of the nurse is insufficient. The use of one or two feedings a day from the bottle after the third or fourth mouth may do much to relieve the mather from the strain of nursing entirely, without disturbing the infant's progress. During the later menths more feedings may be introduced for the purpose of gradual wearing.

BREAST-FEEDING

Care of the Breasts during Lactation.—For the safety of both mother and child it is essential that the most scrupalous attention be given to elembranes. The applies, and the breasts as well, should always be carefully washed after each marsing. Usually plain water is sufficient, or a weak borie-arid solution may be employed.

Nursing during the First Days of Life.—This is revessary, to accustem the child and the mother to the procedure, and to empty the breasts of the calestrum; it probably also premotes afering contractions. All these results can be attained by putting the child to the breast on the first day once in six hours, on the second day once in four hours. The

shild gets from the breast only from four to six ouncer a day during the first two days. Did he require more counshment before the milkthose is fully established, we may be sure that Nature would not have. been so late with her supply. The common practice of administering to an infant a few hours old all sorts of decections, with the idea that because he cries he is suffering from colic, can not be too strongly condemned. A certain amount of erging is desirable. In exceptional circumulances, when an infant is unusually large and strong and cries excessively, it may be accessary to give food even on the first day; but this is not to be the rule. A little warm water should first be given; from two to four teaspoonfuls at a time are sufficient. If this does not satisfy the child, regular feeling should be begun on the second day, Should the milk be delayed beyond the second day, the child should be put to the breast at regular intervals, but only for two or three minutes, and then given the tottle afterwards if still lumgry. It is important not to come in our efforts to induce a secretion for several days longer, and the best of all names is the stimulation of the child's sucking.

Nursing Habits.-Good habits of nursing and sleep are almost as easily formed as had ones, provided one begins at the outset. Much of the wear and tear incident to the narsing period may be avoided if the child is trained to regular habits. Attention to these minor points often makes all the difference between successful and unsuccessful nursing. After the third day, seven nursings in the twenty-four hours are sufficient, and no more should be allowed. An infant at this age can usually be depended upon to take at least one long sleep of from four to six hours in the twenty-four. For the rest of the day the child should be awakened, if necessary, at the regular nursing time, and put to the breast; this plan being continued until ten o'clock at night. He should then be allowed to sleep as long as he will, and but one mursing given between this hour and six in the morning. In the course of two or three weeks a healthy infant can usually be trained to nurse and sleep with almost perfect regularity-frequently, when a month old, going six hours regularly at night without feeling. A trained nurse of our acquaintance states that out of thirty-three infants of which she had the care from birth, thirtyone were trained without difficulty in the manner stated. So far as the child is concerned, regular habits of feeding and sleep, and regular exacuations from the bowels, which nearly always go with them, are most important factors in infant hygiens.

Less frequent nursing and relieving the mother of night nursing after the child is three months old are of the greatest value, and by lessening the wear and tear of nursing will often enable her to continue lactation, when otherwise it would be brought to an abrupt termination. On no account should the child be allowed to sleep upon the mather's breast,

Schedule for Breast-Feeding

Age	Number of Number of 24 Bears.	Duting the Day.	State Survings Between 10 p.m. and 6 a.m.
First day. Second day. Three days to three months. Three to six months. After six months.	4 6 7 6 5	Hours. 6 4 3 3 4	1 1 1 0 0

nor in the same bed with the mother. The temptation to frequent nursing is thus largely removed. No mere sentiment in regard to these matters should be allowed to interfere with the plain dictates of reason and experience:

Symptoms of Unsuccessful Nursing during the Early Weeks.-Attempts at maternal nursing so often result in failure, jeopardizing the health, and even endangering the life of the child, that it becomes a matter of the greatest importance to decide this question of nursing aright, and as early as possible. On the one hand, one should not hastily wean a child on account of symptoms which may have no connection with the food, nor should one advise wearing when the indigestion from which the infant is suffering is due to causes which are temporary and remediable. On the other hand, nursing should not be continued simply because a consecutions mother desires it, when every indication points to failure. If artificial feeding is to be employed the difficulties are fewer when it is begun early than after the digestive organs have been deranged by several weeks of poor nursing. These cases form a very considerable group and present peculiar difficulties in practice. While a decision is being reached as to the ability of the mother to nurse, there is required close observation and a careful study of all the conditions, and even then the physician is liable to make mistakes.

The body-weight gives valuable information. The child does not gain or continues to lose after the usual initial loss of the first three or four days. Observations on the weight at least twice a week are necessary, and in cases presenting special difficulties the weight should be taken daily.

At times there may be no vomiting, diarrhen, or even severe colic, yet the child may fret and worry continually, sleep but little, and slow general discondert. Such symptoms are conscious due to indigestion but are more frequently due to hunger. In other cases definite symptoms of gastric indigestion may be present, usually comiting or frequent regurgitation of small amounts of undigested milk, later mixed with mixes; eractations of gas with or without vomiting may occur, and distention of the domach with gas and gastric colic may follow.

More often the symptoms of indigestion are intestinal. Occasionally there is constipution, but as a rule the stools are frequent, thin and green, containing flaky masses of inalignated mark, and, after a short time, mucus is present. At times there is much gas and the stools are sour and irritating. If constipution is present there is apt to be severe colic and semetimes abdominal distention. The almost uniform absence of any elevation of temperature in these cases points strongly against the existence of any infection, which is further indicated by the prompt recovery under appropriate treatment.

Before considering the case one of inadequate nursing, or simple indigestion in a nursing infant, one should be careful to exclude organic conditions, particularly, if remiting is present, hypertrophic stemssis of

the pylorus.

As the first step one should embayer to gain some idea as to the quantity of milk secreted. During the first week, particularly from the second to the fourth day, the temperature may be elevated quite apartfrom septic or inflammators conditions or even evidences of indigestion. This is particularly seen where the breasts secrets almost nothing (see Insuition Fever). Often when the milk is very scanty something may be learned from the manner in which the child takes the breast. When the milk is abundant, five or air minutes are often sufficient. If the milk is very scanty, an infact will frequently mars, half or three-quarters of an hear and then step, more because he is exhausted than because he is satisfied. Sometimes, when the broads are practically empty, the child will seare the nipple and nurse vigorously for a low moments, then drop it in apparent disgust and refuse to make my further efforts. The only satisfactory way of determining the quantity of milk secreted is to weigh the infant before and after nursing. This should be done at each nursing until all doubt is removed. If the milk is merely scanty, but not otherwise abnormal, the infant does not gain, but may show no symptoms of indigestion, such as comiting, colic, or undigested stools, and he frets and cries from lumper only.

An excessively rich milk is usually found under the following conditions: The mother is in good leadth, has large breasts which are full and tense at nursing time. In most cases she is upon a very abundant diet, getting little or no exercise, and frequently taking some alcoholis between with the notion that because the child is not thriving the milk is poor. The child may be colicky, alcepless, and uncomfortable, may comit, may have frequent stools containing much unsigneded food, and may be being in weight. A similar condition is often seen when a wetnessee makes a change from the simple life and liabits of her surn home.

to the more luxurious life and diet of the family to which she goes. The milk then has usually a high specific gravity, is high in fat and usually high in protein.

A scanty malk of a poor quality is most often seen when the mother is definate or anemic, or perhaps has had a difficult or complicated labor, and who besides is anxious and worried. It is often with the greatest difficulty that one can secure the necessary half ounce required for examination. The milk is usually low in total solids and very low in fat. The specific gravity may be only 1.024 to 1.027, and the fat only one per cent or less.

A disturbed or disordered milk secretion is sometimes seen when the milk is scanty, often when it is very abundant. Like the group of cases just mentioned, this is frequently met with when the mother's general health is below the normal, but particularly is it influenced by her nervous condition. It is the highly nervous emotional, worried woman whose milk we are now considering. During the first week or two the secretion may be excessive and then rapidly diminish; us, though the milk continues abundant, the infant does not thrive. It is most frequently found on examination that the milk is low in fat (9.50 to 1 per cent), while it may be high in protein (1.75 to 3.50 per cent). The child's symptoms are usually those of intestinal indigestion—senses calle, flatulence, and frequent, green, undigested stools.

Management.-The cause of the symptoms being in the food and not in the child, the futility of all medicinal treatment will be at once apparent. He who expects to relieve the symptoms of indigestion by the use of directive ferments, by giving semething before the nursing to dilute the milk, or to check frequent intestinal discharges by spium or astringents, will be disappointed. Temporary benefit often follows a dose of castor oil, but unless the milk can be materially changed in composition no permanent improvement in the child is to be looked for. The question usually to be decided relates to the continuance of nursing. We have a choice of four courses: (1) To continue nursing, endeavoring to correct the milk through treatment of the mother; (2) partly to norse and partly feed from the bottle; (3) to stop all nursing temporarily, pumping the breasts meanwhile to keep up the secretion while we attempt to improve its character; (1) to wean at once and entirely. In deciding which of these courses is to be adopted we must take into consideration the condition of the shild, the severity and duration of his symptoms, the findings of the milk examination, and the condition of the mother,

While the analysis of the milk is of some value in determining the course to be purenoid, and should, if possible, be made, it is of much less importance than the child's symptoms. We must be guided not by what the milk contains, but by how sensoully it disagrees. The chemical ex-

amination may show the milk to be of normal average in the proportion of its different ingredients and yet the child be seriously upon by it; on the other band, a stabl may be doing admirably upon a milk which shows proportions which differ very greatly from the normal average. The question always concerns the effect of the particular milk upon the particular child.

When the symptoms of indigestion are severe or have been prolonged at it usually a mistake to attempt to relieve the condition by simply substituting some other food for part of the nursings. This seldom leads to any material improvement in the symptoms, while it does confuse the result, since we can not now tell whether it is the breast or the bettle feeding which disagrees. A letter plan is to stop nursing entirely for a time and try the bettle alone. If the symptoms are at once relieved the wearing should be permanent.

When symptoms point to a scanty milk, but of fair quality—i. s., infant not gaining but without any particular symptoms of indigestion—one is often able to overcome the difficulties and continue the nursing to advantage. Until a decided increase in the milk has occurred the child should have supplementary feedings from the bettle in sufficient number to insure his being properly contribed. This may be done by giving one or two entire feedings a day from the bottle or a smaller amount mus to given immediately after each nursing. In this way the advantage of the stimulating effect of suckling upon the secretion of milk is secured.

In the treatment of the mother the first thing is to secure for her an undisturbed rest at night. If possible, she should be entirely relieved of the care of the infant at this time, and if feeding is necessary the bottle should be given. She should have a certain amount of fresh air every day, driving if possible, or walking as mon as she is able to take more artise exercise. Gentle massage of the breasts is often useful in stimuslating secretion. It should be done with cure and with every premution against infection, and may be repeated two or three times a day for ten minutes. The diet should be aburdant, with a large allowance of milk and meat, especially beef. If there is attenta, iron should be given-Every means should be taken to improve her general nutrition, and allay her nervous symptoms for whatever benefits these improves the malk. If the conditions present are incident to the confinement or the containscence, the prognosis is good; and in the course of a week or two very marked improvement may be evident, and lactation may be successfully continued. If, however, the conditions depend upon constitutional debility, the prognosis is much worse. Temporary improsement may take place, but it soon becomes evident that the nursing in a failure.

When the symptoms are found to be associated with an over-rick milk the prospects for continuing nursing are much better than when the milk is poor. Unless the infant's direction is very feelile or has been seriously upset other with vomiting or durrhen, see can usually so alter the milk by treating the mother as to make it possible to keep the haby at the breast. Alcohol should be prohibited; the diet, sepecially the amount of solid food, should be reduced, and the mother required to take daily exercise in the open air, particularly by walking. The intervals between musings should be lengthened, always to three hours, and often to four. In some cases there is an advantage in diluting the milk by allowing the child to take water before putting him to the breast. The improvement following such a change in regimen is often immediate, and with increasing age and weight the child gradually becomes accustomed to and is able to digest the rich milk. If, however, the child's symptoms of indigestion are of an aggravated type, whether gastric or intestinal, it will be necessary, even though the weight is increasing normally, to stop nursing entirely for a time. The breasts should be pumped at regular intervals and the child placed upon some other food until the symptoms are relieved, and then brought back gradually to breast-feeding,

If the examination shows the milk to be of very poor quality (i. c., sow in fat, law in total solids), whether scanty or abundant, the outlook is not good. It is seldem that the combitions affecting the mether, to which such a milk is due, can be removed.

When we see a fretful, colicky, skepless infant with either no gain in weight or a loss of a few ounces a week, and with stools which never approach the normal, and these conditions have lasted for three or four weeks, we are justified in taking the child from the breast at once. When the symptoms are less pronounced, and especially when, in spite of all discomfort and indignation, the infant is gaining in weight, even though not rapidly, further efforts may be made before weaning is ordered.

Summary.—Poor milk is usually low in fat and scanty in quantity, while the protein may be either high as low. Very rich milk is usually high both in fat and protein. Very poor milk can seldom be permanently improved unless the causes are very definite and of a temporary character. Over-rich nells can usually be improved if the true explanation for it can be reached. Results are to be judged not so reach by the change in the composition of the milk as by improvement in the infant's symptoms. Since good feeding gives so much better results than poor surving, if circumstances are such that artificial feeding can be properly dear, it is advisable to stop muring after a fair trial—e. g., of two to three weeks—has been made, rather than weste time in pro-

longed efforts to improve the breast-milk. On the other hand, under combitions in which feeding is likely to be very badly flore, one should persist for a longer time in efforts to promote inclution. But in no circumstances should one hastily and without carefully considered reasons advise a woman not to try to nurse her baby.

Wet-Bursing.—In the selection of a wet-nurse, it is by no means so essential as has generally been supposed, that her child shall be of about the same ago as the child she is to nurse, for, after the first two or three weeks, the changes in the composition of breast-milk are insignificant. It is always descrable that the wet-nurse shall have nursed her own infant long enough to demonstrate the fact that she has an aluminate of good milk; hence, taking a set-mirse at the end of the first or second week is always fraught with considerable uncertainty. It is the quality of the milk, not its ago, which determines whether or not it will agree. For an infant over one mouth old, a good wet-nurse whose milk is anywhere between our and six months old will usually answer perfectly well, and even for premature infants such a milk may be used without besituation, but it should at first be diluted.

A good nurse most, first of all, by a healthy woman, free from exphilitie or tuberenious taint. The evolutes afforded by a careful physical examination of the nurse and her own shild may be considered sufficient. The tutercalin akin test is of no value in deciding whether a nurse shall be accepted or rejected. We are not set in a position to assert that a Wassermann test should be employed in every case before selecting a name. The name must have good mammary glandular development. The breasts should be full and hard three hours after nursing. They may be very large and yet supply very little milk, being then composed almost entirely of fat. On the other hand, some smaller breads may be almost all glandular tissue and worste an abundance of milk. The difference in the size of a breast before and after nursing is one of the best guides as to the amount of milk it is secreting. The nipples should be free from erosious or fissures, and long enough for the needs of the child. Preferably a wet-nurse should be of a phlegmatic temperament, and of a good moral character. This is desirable for personal reasons, although there is no evalence of moral qualities being transmitted through the milk. It is desirable that she should be between twenty and thirty years of age, although much more depends upon the individual than upon the ago. An examination of the milk may be of some assistance in selecting a mone; but the best evidence to be obtained of the character of a woman's milk is the condition of her own child, which should always be seen before she is accepted. It often happens that a woman who has had an abundant supply of milk for her own infant has very little for another infant for the first few

days in her new surroundings. It should not be too readily decided that she is incompetent as a surse, for, under most circumstances, with proper treatment the regular flow of milk will be re-established.

Weaning.-Weaning should always be done gradually, when possible, for the sake of both mother and child. Sudden weaming is apt to be followed by an attack of scate indigestion in the infant. This, however, is not a necessary result, and usually depends upon the fact that the child is given too high percentages of coo's milk at the outset. Weaning in hot weather is usually to be avoided, but the harm from this is not nearly so great as sometimes results when lactation is unduly prolonged became of a prejudice against a change of food at this time. While there are many women of the lewer classes who are able to nurse their children to advantage for the entire first year, the number of such among the upper classes is small. By the latter, nursing can rarely be continued borond the ninth, and often not beyond the sixth month, without unduly draining the vitality of the mother and at the same time harming the child. Since the early months of breast feeding are the most important, every effort should be made to have the mother continue musing for five or six months. There is seldom trouble in feeding a haby for the second half tear who has done well upon the breast for the first half.

The late months of lactation, like the early months, require close watching. It is a common mistake to continue both maternal and wet-missing too long, owing to a dislike of making a change when things are going tolerably. If it has not been done before for reasons previously considered, breast-feeding should be supplemented by other food by the ninth or tenth menth in any case. The child's progress in weight in a good guide as to time of beginning. In the absence of evident signs of disease, a stationary weight for several weeks makes wearing advisable; a steady loss makes it imperative.

The accompanying weight-chart (Fig. 17) illustrates this point.

When a nursing infant has been are intomed from birth to take one feeding a day from the bottle—always a great convenience to a nursing mother—gradual weating is generally an easy matter; otherwise it is sometimes an impossibility, the shald refusing all food except the breast so long as this is given, and nothing but starration inducing him to take food either from a bottle or a speen.

Sudden wearing may be required at any time from the development in the mother of acute disease of a serious nature, such as typhoid fover or pneumonia, or grave chronic disease, such as tuberculous or nephritis, from the intervarience of pregnancy, or from disease of the manumary gland. Through many of the minor illustrated attacks of broachitis, pharyngitis, indigestion, and even material fover—mothers frequently noise their children without any seeming detriment to them or to themselves. In acute illness of abort duration, if severe, it is usually better, unless we decide to wear altogether, to feed the child from the bottle and to maintain the flow of milk by the occasional use of the breast-pump three or four times a day rather than to allow it to dry up. The previous flow can often be re-established after an interruption of a week or two, and sometimes after a much longer time.

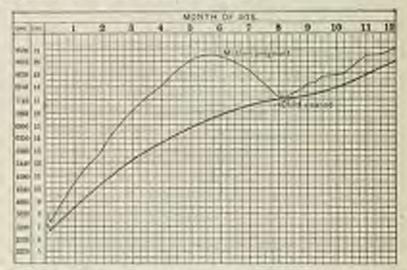


Fig. 17.—Chair encerco see Erracy or Paganacy r Uros one Warner or a Nemuon Intrave. The upper line is that of the patient; the lower one is the average line for the first year. The initial dist assessably well used the earth month. As it did not seen if, the parents were not distarched until the line had ranched it in. Feeding was at once began, and stall gradually regained in lest weight. It was subsequently discovered that the modber was prognant.

In case of sudden wearing, the food should in the beginning be very neach weaker than for an artificially fed child of the same age. The change can then be made without causing disturbance. When the infant has become somewhat accustomed to new's milk the strength of the food may be gradually increased.

The difficulties in weaning a child who up to nine or ten months has had no food but the breast, are semetimes great. Much time and tact are necessary on the part of both physician and nurse in these cases. To try to teach older infants to take the bottle is unwise; feeding from sup or spoon is usually quite as easy. Continued coaving of food is objectionable; forcing is much worse and prolongs the struggle. In our experience we have found the last way to offer food at regular intervals and to take it away at once if refused. This is repeated every three or four hours. A variety of things may be offered—modified con's

milk, thick grossly, beef juice, brother bread and milk, etc. The nature of the food seems to make very little difference. A strong-willed child will often hold out for twenty-four or thirty-six hours, and occasionally a very stuffern one is bound who will do so for furty-right hours. At the end of this time the pange of hunger are generally so neute that he capitulates. Serious symptoms from withholding food in each circumstances we have never seen.

MIXED PERDING

By mixed feeding is meant a combination of nursing and artificial feeding. There are us objectious to this practice; on the contrary, there are great advantages in giving an infant only a few breast-feedings a day when more are impossible. This may frequently be done in hospital practice, and thus a single wet-nurse may assist in the feeding of several infants. Mixed feeding may be resorted to whenever the milk supply of the mother is insufficient. If at any time the mother's health begins to suffer, she may be relieved of night nursing or of one or more sursugs during the day, and the hottle solutitated. In this way she may be smalled to continue lactation for some time longer than would otherwise be possible. Mixed feeding is often necessary during the first few weeks, while the mother's milk is insufficient in consequence of something which has retarded her convalescence. For the advantage of the stimulation to secretion afforded by the child's nursing, it is neally letter, rather than alternate the breast and the bottle, to put the child at first to the breasts. After he has emptied them, additional food may be given from the bottle if the buby is still hongry. The milk may become abundant and of good quality as soon as the mother is well erough to be up and out of doors, although it was previously scanty and of inferior quality. Two or three feedings a day from the bottle helps to bridge over this period and prevent the child's nutrition from suffering. But before allowing a mother partly to nurse and partly to feed her infant, one should be sure that the quality of her milk is good.

ARTIFICIAL FEEDING

The scientific feeding of infants, whether with woman's milk or some substitute, demands as a basic principle that the food furnish what the body needs for heat and the repair of waste or the "maintenance requirements" and also for its normal development or "growth requirements." In breast feeding there is, under normal conditions, a certain automatic adjustment between the amount of food needed and the amount supplied. If the milk taken is greatly in excess of requirements, this excess is either disposed of by vomiting or passes through the bowels in large partly digested stools. Sometimes this results in considerable disturbances of digestion; but usually they are slight. If the milk secreted is much below the child's requirements, this fact becomes evident by slower growth and by symptoms of defective nutrition, of which the weight is the best guide.

In artificial feeding, simply because the food given is not a normal one for the individual, it becomes even more important that the requirements of the infant, as nearly as they can be determined, shall be met. With any substitute both an excess and a deficiency are more potent for harm than with the instant food of the infant. The best results with artificial feeding, i. e., most satisfactory growth and freedom from disturbances of digestion, are seen when all that the body needs in supplied but no more than this.

The appetite of the child has been deemed by many a sufficient guide to the amount of food needed; to give a child all he will take at one time and postpone the next feeding until he shows that he is hungry has been advocated as a "natural" method of feeding as opposed to the more commonly followed plan of definite quantities at regular internals. Though important, the child's appetite alone can hardly be relied upon. There are many infants, like many adults, who will habitually take too much find if it is offered. Disorders of digestion not infrequently are accompanied by an unmatural desire for food.

Formerly, it was ensteading to indicate the amount of food given to an infant by stating the number of sunces in twenty-four hours. This, however, is really meaningless unless the strength of the food is also mentioned. In deciding the amount of food to be given the nutritive or soloric value of the food must be taken into account. We must know approximately the infant's needs, but stated in calories, and then in what form these may test be furnished, best stated in the percentages of the different food elements.

From numerous observations the nutritive needs of an infant of average size and weight and activity in health have been shown to be 180 to 130 calories per kilo. (45 to 48 per pound) of body weight for the early menths of the first year; gradually diminishing to 70 to 80 per kilo. (30 to 35 per yound) by the end of the year. A food much above or one much below normal requirements may be equally unsuitable and therefore manacessful. The physician should therefore be able to calculate the calorie value? of the food given to see, if possible, when an infant is not thriving, where the mistake lies.

[&]quot;The calone value of any modification of cow's milk of known percentages may be calculated as follows:

For the average healthy infant the weight is perhaps the most important single factor, but age, size, appetite and general behavior must also be taken into account. The experienced physician or nurse by closely watching a child's symptoms is able to decide whether the food is adequate, excessive or deficient. Food needs based on weight are useful as a general guide until the individual factor can be determined.

General Principles.—There are certain principles in infant feeding upon which all pediatrists are agreed: Woman's milk is not only the best, it is the ideal infant food; in any substitute certain conditions must be fulfilled.

- All the different food constituents—fat, carbohydrate, protein, salts and water, must be furnished.
- 2. They must be supplied in sufficient quantity for the physiological requirements of the infant for growth, energy and repair.

In this respect as in many others Nature tolerates considerable varia-

For instance, 36 ounces of food having fat, 3.90; sugar, 7.90; protein, 1.75 per cent.

185 that per cent at 3 miles value of far. — 225 sales is taken in 2 gram of food
157 index — 257 — mager — 257 — mager — 1
1573 formula — 4.1 — — periods — 257 — — product — 1

.684 x 100 = 25,5 (caloria value 5 outco of food) x 100 = T25, values value total food

Such calculations are too laborious for practical use. Fraley (Archives of Pediatrics, 1912, p. 123) has deduced a sample formula which makes this an easy matter and gives results quite accurate. This we have slightly modified:

Twice the fat percentage, plus eight percentage, plus protein percentage, multiplied by 1.3, gives the calories per curier of food. Applying this to the formula above mentioned: $7 + 7 + 1.75 = 15.75 \times 1.3 = 29.5$ calories per curies.

Another smople way is to multiply the caloric value of each of the ingredients in the food by the amount of each that is taken.

Approximate Caloric Value of Different Foods

	Guara	Resident.		Ounce	Sees Telding 1
Nomes's publication of the Court of the Cour	おおの 単二日 最近 五元 名名	200	Destination Mail may estruct Barley floor Wheat floor Oat floor Barley grade (I on to 18 on) Barley grade (I on to 18 on) Barley mater (I tablesy for to 190 Memory water (white per ong to 1 pt.) Bod Jone Ommar judes Oder	126 30 30 30 30 30 111 10 2 315	90 90 33 35 90

Assessment Manager

	ever.	inblergoonfule	=	energy.	1/2	might.
Case inger. Depresentations	1.0	4	8	1	8	
Barley or out floor. Wheat floor	3		Ξ.	3	E	8

tion from what is best without seriously hampering health or growth. Yet there is a maximum which if exceeded causes disturbances of digration from coerficoling, and a minimum below which the body suffers from imperfect nutrition. Mistakes in the amount of food may be just as serious as those in its composition.

3. The fixed constituents must be furnished in suitable proportions. The proportions best suited to the infant's needs are shown in the composition of an average specimen of weman's milk. But as the normal variations in weman's milk may be considerable without affecting the infant unfavorably, so a certain amount of latitude in the composition of the artificial food which is substituted for woman's milk is tolerated. To a certain extent the different food elements, notably the fats and carboloulrates, are interchangeable; but this substitution must not be carried too far nor continued too long. In the scientific feeding of animals much stress is laid upon the importance of a properly "balanced ration" or one in which all the food elements are adequately represented. The same necessity exists in infant feeding. Weman's milk is such a balanced ration and we cannot give for a long time a food in which the proportion of the different food elements differs widely from those which woman's milk contains without incurring serious risks.

Cow's milk in some form is now almost universally accepted as the hasis of artificial feeding. The milk of the goat or of other animals, though at times advantageous where good cow's milk is not available, has, because of many circumstances, never been general. In adapting coe's milk for infant feeding we must realize at the outset that no matter beer it may be altered it is not a perfect substitute for woman's milk. There is no perfect substitute. But while its disadvantages may not be altogether removed, they may be lessened by certain changes, bechnically known as the "modification" of cow's milk.

Differences between Cow's Milk and Woman's Milk.—There are certain differences between cow's milk and woman's milk upon which these modifications are based. These relate both to the amount of the several constituents and their digestibility. The following table gives the proportions of the various elements which make up the two milks:

	Woman's Milk Average.	Cive's Stills
First. Sugar Protein Sulta Water	7.50 1.25 0.20 87.53	4.00 4.73 3.00 0.73 87.00
	100.00	106.00

These quantitative differences are important. It will be seen that cow's milk has a great excess of protein and salts and is deficient in sugar, while the proportion of lat in the two milks is nearly the same. When we come to use cow's milk in infant freding, certain qualitative differences are discovered which from a practical point of view are of even more importance. The proper modification of cow's milk must take account of all these. During the past twenty-five years widely different opinions have been held as to the character of these differences between the two milks and consequently as to the nature of the difficulties which the infant has in digesting cow's milk. At different times the fat, the protein, the engar and the salts have all been accused of being the chief cause of disturbances of digestion, and it is no doubt true that under certain circumstances any one of them may be a source of trouble:

Protein.-Cow's milk contains nearly three times as much total protein as does woman's milk; the greater part, about five-sixths, being easein, and one-sixth, albumin. In the protein of woman's milk the proportion of casein is about one-third; of lastalloumin, two-thirds. The casein of cow's milk differs in many respects from the casein of woman's milk. The excess of protein, especially the excess of easein, and the differences in the two caseins was long believed to be the chief cause of difficulty in digesting cow's nells. The studies of the past few years have, however, shown that the casein of cow's milk is remarkably well digested and absorbed under nearly all conditions. Like that of woman's milk it is converted into peptones and finally broken up into amine scids. Metabelism experiments, moreover, have shown that nitrogen referation in infants taking com's wilk is quite normal and examination of stools rarely shows evidences of undigested protein.

The chief difficulty in digesting casein of row's milk seems to be mechanical, owing to its congulation in the stomach of certain infants in large solid masses which offer some resistance to the action of the digestive fluids. Congulation in large masses may be prevented in several ways: (1) by greater dilution of the milk; (2) by the use of gruels in the place of water as a diluent; (3) by boiling. Congulation of milk in the stomach may be almost entirely prevented by the addition to the food of certain substances such as sodium citrate. It seems very doubtful of this is wholly desirable.

The amount of protein of cow's milk required for infant nutrition is greater than that of woman's milk. The reason apparently being that the casein of cott's milk, which is five-sixths of the protein, is delcient in certain amine acids essential for growth. These are supplied abundantly in woman's milk, whose protein is two-thirds factalhumin. The defects of the casem of you's milk are in a measure overcome by

increasing the quantity given. There is no evidence that the protein of cow's milk is barmful to the infant even when given in considerable excess of the amount contained in woman's milk. Disturbances of infant digestion are very rarely due to the protein of cow's milk.

Fat.- The high fat content of woman's milk indicates the importance of fat in the nutrition of the infant. The amount of fat in cow's milk is about the same as in a good average sample of woman's milk, i. e., 3 to i per cent. But there are certain important differences in the fat in the two milks. Thus the fat of cow's milk contains a much greater proportion (nearly eight times as much) of the volatile fatty acids. The marked difference in digestibility of the fat in the two milks is believed to depend to a considerable degree upon this fact. It is possible also that the freshness of the fat may have an influence. Be this as it may, it is found practically impossible to give to most infants as much of the fat of cow's milk as woman's milk contains. It is not wise to inerease the amount of fat until symptoms of intolerance appear, for the intolerance to fal is more persistent than to any other ingredient of the food. Such intolerance once established, it may be weeks or months before a reasonable quantity can again be directed and absorbed. The tolerance to the fat of con's milk varies greatly in different children. Some can take a large quantity and some only a small quantity. The difficulty is greatest with infants in the first few weeks, with the feeble and with those who have suffered from previous nutritional disturbances. Fat is also hadly borne when there is disturbance of gustric or intestinal digestion, also in all febrile conditions, no matter from what cause, and during periods of very hot weather. A failure to regard these contra indications is a constant source of trouble in practice. The ability todigest fat is probably the best index of an infant's digestive espacity. Those who cannot take the usual amount certainly do not thrive as well as those who can. Hence it follows that no part of the milk medification needs to be more carefully watched than the amount of fat given. The percentage of fat that can safely be allowed to a healthy infant varies from 1 to 1 per cent. The latter figure should not be exceeded with any infant and with very many even this cannot be reached until the end of the first year.

Carbolydrates.—That all the carbohydrates of woman's milk are in the soluble form is a strong indication that soluble carbohydrates, or sugars, should be the form supplied in artificial feeding. The high proportion in which sugar exists in woman's milk—being considerably greater than all the other solid constituents combined—shows how important a part sugar serves in infant nutrition. In case sugar is not furnished in the food in sufficient amount, there must be more fat and protein supplied. The sugar in cow's milk is identical with that in woman's milk, in both cases being factose in solution. In artificial feeding we have a choice between milk sugar, cane sugar, and multose.\(^1\) All of these sugars are about equally well borne in health; they all, alike, have the capacity of increasing weight and furnishing heat. Yet there are some differences in their effects which make it advantageous at times to choose one rather than another. Milk sugar, being identical with the sugar in woman's milk, on theoretical grounds would seem preferable. It does not ferment with yeast. It is not so readily booken down in the stomach and hence with infants who have a disposition to vomit it is usually to be preferred to maltone or cane sugar. It is slightly laxative. It is usually well borne in health in proportions up to 6 or 7 per cent of the food. In all intestinal disturbances, particularly where there is a tendency to looseness of the bowels, lactose is badly borne.

Case sugar has the great advantage of sheapness. In a very large, proportion of cases it apparently does quite as well as factose or maltose. It is distinctly los laxative but rather more likely to ferment in the stomach and cause or aggravate vorsiting when given in the quantities mentioned for factose.

Maltese, in the preparations in which it is used, has some peculiar advantages; first, its lanative offect which is rather greater than that of the other sugars; secondly, in induring a more rapid gain in weight; and, finally, in a certain corrective action upon some digestive disturbances, especially when given with considerable amounts of starchy food. Maltese preparations have the disadvantage in breaking down more readily both in the stomach and in the intestine, often provoking and, in susceptible infants, always aggravating both comiting and diarrhea.

For routine use factors is to be preferred except where cost is a consideration; the other sugars are to be used with the special indications mentioned. There is often an advantage in using the different

[&]quot;Pure maltose is expensive and practically not available for miant feeding. The maltose preparations used for infant feeding are mintures of malties and destrins. In speaking of the use of maltose hereafter these preparations will be ment. Many such preparations are so the market. Loefund's "malt soap intent" is reliable but expensive. Reliable and more moderate in price are the "neutral maltose" of the Maltinyme Co., the malt cosp of the Maltine Co. and the "malt syrup" of the Freshofer Co., Philadelphia. These preparations are semicurbat and. To the first five grains and to the last ten grains of potassium rarbonate should be added for each owner of the mult used in the food. All of these liquid preparations contain from 65 to 85 per cent of carbohydrates, of which about two-thirds is moltose and the balance cheffy destrine. Bendes these liquid preparations, Borcheelt's "malt soap carract" and Mend's "destrinations" in powder should be mentioned as convenient and reliable forms of maltose. None of the above preparations has any approximate diagraph action.

sugars together succe the amount that is well telerated of the combined sugars is often greater than if the entire amount were one form of sugar.

Storches.-Even very young infants are able to digest starch, though their capacity during the early months is limited. After the fourth month it notably increases and after six or seven months most healthy infants can readily digest as ranch as one onnce of starch daily, and some can do much more than this. This fact makes it possible to use starch in the form of cerest grads under a variety of conditions when they may be thought desirable. With very young infants their use is mainly as diluents for milk when the congulation of the casem in the stomach in large masses is an obstacle to digestion. With older Infanta starches may supply a considerable part of the earbohydrates when there is marked intolerance of all sugars. For the very slow change of the starch into ougar in the intestines is much less likely to cause symptoms than when sugar itself in considerable amount is thrown at once into the intestine. Again, starches are useful to increase the total carbohydrates when all the sugar is being given that the patient can readily tolorate and especially when, on account of intolerance of fats, it is desirable to raise the total carbohydrates to a point considerably higher than is neually given.

Satts,-It has been customary in the past to add certain integrable constituents to cow's milk used for infant feeding. Lime water his been most widely employed. As has already been stated in the previous chapter, not only calcium but practically all the selts of woman's milk are present in greater abundance in cow's milk, even when the latter has been diluted to the customary degree. These substances need not be added to milk to supply a deficiency in incepance constituents, for there is none, except in iron. Their addition to correct the "excessive acidity" of cow's milk is unimportant, for as used they do not do this, In considerable amounts, time water, sodium bicarbonate and sodium citrate all delay the congulation of milk in the stomach, and in large amounts may entirely prevent it. Under certain conditions the first-mentioned effect may possibly be desirable. It is questionable whether the latter ever is. At the present time we are not in a position to assert that the addition to milk of time water or any of the substances mentioned is of value as a routine practice in infant feeding. They may therefore is wisely omitted with all healthy children.

Peeding of Healthy Infants during the First Year.—It is shouldedy necessary to consider separately the changes required by healthy infants with normal digestion and those required by infants with fashle or disordered digestion. From a failure to make this distinction much confusion has arisen. The digustion of all healthy infants is very much alike and they can be fed in much the same way; while the variations afforded by infants with disordered digestion are very great.

There are two general plans according to which the indications outlined in the previous pages may be met. The first plan is to use whole milk as indicated in the table given below, the different formulas being derived by simple dilution and the addition of needed sugar or other carbohydrates. The table gives the quantities of the different ingredients, the approximate percentage composition and caloric value per source of the formula obtained. The age indications are not intended to be closely followed. Successful infant feeding cannot be done by rule of thumb. However, these formulas are a useful guide as a starting-point with an average child until his individual needs and capacity can be determined by observation. They indicate what such a child in health may be expected to take and also how rapidly and in what way the food may be increased."

Formulas from Whole (4 per cent) Milk Giring Approximate Percentage Composition and Calorie Value

	1	11.	1111.	IV.	V.	VI.	VII	viii,	1X	X.
Mile invarient Water (namonal Grani 1 ioutoon) inquer 5 oven table so life .	11 101	70	*	11	10 10 114	254	127	H A	14	150
Total	21	20	20	20.	200	29	21	20	20	20
Fai, per cent Sugar, per cent Stands, per cent Frances, per cent	1.00	1 90	6.00	1 300 5 300 1 400	2 00 5 50 1 35	2 30 6 50 1 90	7 40 0 80 2 20	2 8 8 E E	2 MO 0-30 2 MO 7 MO	2 00 1 00 1 00 2 00 2 00
Chlorus per mare	11.3	17.1	11.3	16.5	15.5	14.5	IT O	EX D	20.0	71.0
Approx Apt Indication	I da	Service Control	Production I	(married)	Section 2	ē mo.	-	6 mo	5 mo	9-11

^{*}The grant have indicated in made to the properties of I us. by volume to 20 us. of water,

*Alfit maps: is here indicated; of case waste use two scars tablespoonfuls instead of two and a half,
and are instead of one and a holf, etc. Marton may be used in the same amounts as suff, eager.

[&]quot;A simple method of calculating a milk formula for an average healthy infant on the basis of calculating a milk formula for an average healthy infant on the basis of calculation requirements is to start with the daily rescent of protein of raw's milk needed. This hy experience has been found to be furnished in 11 cames of milk for each pound of body weight. An infant weighing 10 pounds will thus require 15 cames of milk. His calculate needs calculated at 45 per grand will be 450. Of this there will be furnished in the milk (20 calculation per source) 300 calculate, leaving 150 to be made up by more lat or by nathon-bounds—magar or starch. One states of sugar will wild 120 calculate; or 11 seniors, 150 calculate. This will give the food values for a day. There is still to be determined the amount of difficult, which will depend upon the infant's daily need of find. This has been shown to be about 3 causes for each pound of body weight in the early months, and 2 cames for each pound in the later

According to the second plan of feeding, after the first few weeks amendat higher fat is employed than indicated above. This is accomplished by using the upper half of a quart bottle of milk, i. e., a 7 per cent top-milk! instead of whole milk. If this is done the amount of the milk used should be ene-fourth or one-third loss than is given in the table. These formulas may be used up to seven or eight months, when, with the introduction of larger amounts of starchy food, formulas from whole milk may be given. Such formulas are designed for infants who are able to take more fat than is contained in the formulas from whole milk. In this group will be found strong children with good digotion.

Relative Advantages of Formulas from Whole Milly and Those with Higher Fals.-Whole milk formulas are somewhat simpler to prepare and the method is therefore more easily understood by the average mother or nurse. With the ignorant or careless there is less chance of going wrong, for it climinates one error, by no means an uncommon one, of using too high fats. There is quite a large group of infants who are unable to digest higher proportions of fat than are given in this series of formulas and who are actiously disturbed if they are given: but there is a third group, also a large one, who can easily take higher fats and some thrave much better when they are given. Constipation also is somewhat less frequently seen when top-milk mixtures are used. There are then advantages in having formulas with higher fats for use under proper conditions. If no more fat is used than is obtained by using a 7 per cent top-milk, as here advised, disturbances from fat will very seldom be seen in healthy children. When less fat is given the caloric value of the food must be made up by increasing the carbohydrates and the protein. Only to a limited degree is such a substitution possible. When fats are replaced by earbohydrates chiefly, quite serious disturbances of digestion may be produced. The great argument for the need of more fat than is obtained with dilutions of whole milk is the proportion present in woman's milk. On the whole, while one

months; i.e., for a 10-yound infant it will be 30 center a day. There will need to be added, therefore, 15 sunces of water. The formula will then be:

> 15 ounces milk, giving 300 calories 11 " mgsr " 150 mater

15

The 30 campes of food could be divided into seven feedings of 42 campes cath, or into six feedings of 5 ounces each according to eigenstatures. The approximade percentage composition of the formula, using \$-percent wife, would be: fat 200; sugar 5.00; protein 1.25.

"Before this top-milk is removed the milk should stand in the bottle at least four hours, and the top-milk should be rarefully removed with a milk

dipper, not pound off.

may get on very well with such simple formulas as those from whole milk, in experienced hands societiest and sometimes better results are obtained with healthy children with somewhat more fat. In infants with feeble or disturbed digestion top-milk formulas should not be used at all. The most important thing in artificial feeding is to recognize at the earliest possible moment the indications making necessary an alteration in the food.

Quantity at One Feeding and Frequency of Feedings.—The strength of the food and the daily quantity having been decided, the next question is the number of feedings in which it is to be divided and the intervals at which they shall be given. Experience has shown that the average infant can digest his food better if the intervals are made isager than was fermenly the practice. With longer intervals the quantity given at one time and the strength of the food may be correspondingly increased. There are few healthy infants who cannot readily be trained to the intervals given in the table below, in which the infant is placed upon three-hour feedings at the outset and upon four-hour feedings when six menths old. The reduced number of feedings also materially lessens the labor of the mother or nurse.

Schodule for Healthy Infants during the First Year

No.	Interval	Night	Fordings	Quantity	Quantity
	Schween	Toolings	in 24	for One	for Di
	Foodings	theritan	Hours.	Fooling	Hours
2nd to 7th day, 2nd 3rd and 4th weeks. 2nd and 3rd manths 4th and 5th months, 0th, 7th and 8th months, 9th and 10th months. 11th and 12th months.	200000000000000000000000000000000000000	2 2 2 1	********	$\begin{array}{c} 0_{0000} \\ 1 & = 2 \\ 216 & = 616 \\ 314 & = 3 \\ 616 & = 716 \\ 7 & = 8 \\ 8 & = 9 \end{array}$	7 — 14 18 — 32 24 — 35 30 — 36 333/j — 37/4 35 — 40 40 — 45

A large and vigorous infant wile require the larger quantities allowed, but these seldem need be exceeded; for a small infant the smaller quantities mentioned, and semetimes less, will be sufficient.

This table really gives only the volume of food for the different ages. This is important as it secures to the infant a proper amount of water daily. The following table shows how the actual food requirements of an average infant may be met, using the formulas given on page 187, and in quantities mentioned.

A schedule like the following indicates the needs of a healthy infant of average size, weight and activity. But no schedule can be closely fullowed with any given child. One cannot conclude became an infant is

Age	Average Calore Separements	Paraded in	
1 month. 2 months 6 *	900 200 500 500 640 740	7 feedings 4% on of No. III. 7 * 6 * No. IV. 7 * 8 * No. V. 8 * 755 * No. VIII. 8 * 754 * No. IX.	

six weeks ald be is able to digest a certain amount of food and a certain other amount because he is six menths ald. To attempt to follow any schedule too closely is to violate the fundamental principle of intelligent feeding, which is to adapt the food to the child's requirements and powers of digestion at the time. Because these figures represent averages they form a useful basis for feeding healthy children.

How and Where to Begin.—With all young infants, even those having presumably normal digestion, it is desirable to begin with a weaker food than would be indicated by their calonic requirements, and gradually increase both the strength and quantity according to the shild's digestion. With small or feelds infants still weaker formulas should be used and the increase made more alonly.

For a healthy child with normal digration who has previously had no cow's milk one should begin with a lower formula than would usually be given to a healthy child of his nice and age, but may increase the strength and quantity of the food more rapidly than with a younger infant.

A stationary weight for a week or two, or even a how of a few conces, is of no importance, provided the change in dist can be effected without disturbing digestion; for as soon as a child become accustomed to cow's milk the percentages can be raised and progress is assured. Nothing is easier than to disturb the digestion in the beginning by the use of too strong food.

Indications for Increasing the Food.—While it is important to begin with weak food, it is a serious mistake to continue long with it. The powers of digestion are strengthened by gradually increasing the work the organs are given to do. Abrupt increases are almost certain to disturb digestion.

How rapidly the increase is made will vary much with the individual infant. With a vigorous child above average weight, and with good digestion, the strength and the quantity may be increased more rapidly than with a smaller or less robust one. We cannot increase the food every week or every month regardless of other conditions. The progress in weight is important, yet one should not be guided by it alone. When it is made the chief concern, there is a constant temptation, if the child is not gaming as rapidly as the mother thinks he should, to increase the food, regardless of conditions and aften beyond his requirements, usually with the result of seriously disturbing the digestion. The best of all guides to increasing the food is the child's demonstrated capacity of digestion. To determine this the child's symptoms should be carefully scatched. If he is not satisfied and is digesting well it is usually safe to increase the food; but not more often than every three or four days in the early months, and every week in the later ones.

In increasing the quantity, it is not was to odd more than two or three owners to the food for the day, or a quarter or half an owner to each feeding. During the early weeks both the quantity and the strength of the food should be increased every few days. It is well to alternate, first increasing the quantity; then after a few days, if still unsatisfied, increasing the strength; the next time increasing the quantity again, etc. In this way will be avoided the error into which mothers and names often fall who adopt a single formula and keep on simply inreasing the quantity indefinitely whenever the child is unsatisfied. The increase in strength should not be greater than from one formula to the next of the series given. It is sometimes advisable to make the increase by steps only half as great as specified.

A caution is necessary against changing the formula too frequently. It is not possible to modify the milk in such a way as to relieve every trivial discomfort or disturbance an infant may have. Nurses are usually ready to ascribe every slight symptom to the food, particularly if they have strong opinions of their seen upon the subject of feeding and are not in full sympathy with the method employed. Very often the cause is outside the food and even of the organs of digestion.

In order to appreciate the composition of any Milk Formula.— In order to appreciate the composition of any milk formula which a putient may be taking it is desirable to reduce this to its approximate percentages. One who forms the bates of making such calculations soon linds it way, and secures a basis for comparison with the percentages given as proper for the average normal child. A simple method of calculation is as follows: 'To determine the percentage of any constituent in the food, multiply its persentage in the original unitk, cream, or topmilk by the number of owners of each in the food, and divide by the total number of ounces of food prepared.

[&]quot;A clold is taking the following food § Whole wilk (4 per cent) 20 ounces, milk sugar 2 eyes tolkispoonlain, and water up to 35 ounces.

The lat is the food will be 11 of 4 or 2.27 per cent. The proving a second will be 11 of 4 or 2.27 per cent. The proving a second will be 11 of 4.75 or 2.77 per cent. The regard a second will be 11 of 4.75 or 2.71 or a

Three even table-possible may be reduced as I series of milk sugar, which

Symptoms and Conditions Required Special Food Variations.—In a new case the most important guide in the first food prescription is a knowledge of the condition of the dignetive organs. One should know besides the age and weight, the nature and quantity of the food which has been taken, the appetite, the number and character of the stoots, and also whether digestive symptoms are present, such as remoting, flatalence, diarrhea, colic or constant discomfort. In any case the first presemption is consewhat in the nature of an experiment. Success will depend on how intelligently the symptoms have been judged.

Even with infants who are properly fed there are few whose digostion remains perfectly normal throughout the entire first year. Changes in the food are therefore necessary from time to time to meet special symptoms which may arise. Many of these are due to disturbances of a minor character, but if they are resignized early and proper changes promptly made, more serious and pretracted decongeneous of digostion can negative be avoided. This is not always an easy matter, but there

are some indications which are very clear and definite.

Hot Worther.—The depressing effects of very hot weather upon young infants should be appreciated. At such times less food can be digested and less is required. Owing to an increase in perspiration, the amount of water, consequently the volume of the food, should solden be reduced. The indications are best met by reducing the milk, the sugar and the starch in the formula and making up the deficiency by adding water, i. e., simply by diluting the food. Especially should the fat of the milk be reduced. An immediate change therefore should be made from any top-neith formula to one from whole milk or at times even to one from skimmed milk. Water should also be given freely between the feedings. But as some infants will not take it, the only after mative is to give an extra amount, half an ounce to two ounces, in carn of the feedings. As soon as the period of excessive heat has passed, the infant can gradually be brought lack to the usual food.

Minor Illucioses.—In attacks of acute rhinitis, otitis, forsillitis, brenchitis, etc., even though not especially severe, the fixed should be reduced. The reduction should depend upon the severity of the attack and the amount of fever. The child's apparent appetite is often only a demand for water. At least as much is meded as in normal conditions and usually more should be offered. The indications may be met in the same way as tertlined in the preceding paragraph.

Familiag .- The mirmon causes of habitual vemiting referable to the

in a 35-same mixture odds about 1 per cent of eagur. The total eagur in the food therefore is 271 + 2 = 571 per cent.

The percentage composition of the food is; fat, 227; sugar, 571; protein, 200.

food are: too frequent feedings and too much food at one time; too much fat or too much sugar, especially if the sugar is either maltose or cane sugar. An infant who vomits often should not usually be fed at shorter intervals than four hours, even if only a few weeks old. If considerable quantities are ejected almost immediately after feeding, it is generally because too much food has been given. A dimination in the amount of food should bring about immediate improvement. When the sugar is in excess, or the fat, or both, there is vomiting or regargitation of ruralled milk or of a sour, watery fluid, which securs frequently and often long after the feeding. The sugar should be greatly reduced or for a time entirely removed; cream mixtures or top-milk mixtures should not be used. If this is not sufficient, the fat should be still further reduced by using less milk or by partially akanming the milk. A return to the former diet should be gradual and for some time neither maltose nor cane sugar should be given.

Other causes must be considered also. The child may be moved about too much or sometimes the clothing may be too tight. More often this frequent regargitation of food soon after feeding is in consequence of swallowed air which the child has taken with his bottle. This is more likely to be the case when an infant is feel while lying upon the back and when taking his food very slowly owing to a very small hole in the nipple. He is unable to expel the gas in that position, but if lifted to the erect position or placed over the shoulder once or trace during the feeding or after it, he will often bring up a large amount of gas, after which the semiting ceases.

Constipation.-The principal causes of constipation referable to the food are, too small an amount of earlichydrates, and too small an amount. of total solids, occasionally too low a proportion of fat. Habit and general training are also important factors. Sterilization, and to a slight degree pasteurization, cause milk to be somewhat constinuting. During the first few weeks, if the food is rather small in amount, there is often a species of constitution present which is simply the result of the low total solids in the food given. The howels may move every day, sometimes even twice a day, but the stools are often small and rather dry. Unless there is manifest discomfort on the part of the infant, such a condition may be disregarded, especially if the odor and color of the stools are nearly normal. As the proportions of all the elements of the food are gradually increased this form of constitution passes away. Mothers and physicians often expect that the bottle-fed infant will have during his first one or two months the two or three large stocks daily to which they have been accustomed with healthy broast-fed infants; but finding instead only one movement a day, and that small and sometimes dry, they resort to layattyee or enemata, and by their use really

cause much of the trouble they are seeking to remove. If milk mixtures are made up without the addition of carbohydrates, constipation frequently results. This is often due to the abstration in the reaction of the contents of the intestines haught about by putrefaction of the protein.

Milk sugar is somewhat hasative and if a smaller amount is being used the raising of the proportion of this ingredient as high as 7 per cent will often be all that is needed. Malton is more laxative in its effects and may be substituted wholly or in part for wilk sugar. Its use will be more fully discussed later. Malton should not be given if there is varieting. Certal gracks, especially catment, also have a favorable influence upon constipation.

Colic and Platatenes —The habitual colic of early infancy may occur with any form of intestinal indigestion; its causes therefore are varied. Colic and flatalence are especially common in infants who suffer from constipation. Excessive flatalence may occur also when cereal gracia are added to the milk of young infants, particularly if the amount is large. If symptoms are severe a reduction in all the elements of the food

may be necessary.

"Clards" in the Stools.—The undigested masses appearing in the stools of infants taking milk are usually species of as "curds." These may be small, soft and white, and may make up a large part of the boostool. An excess of mucus is usually present. Such masses are composed almost entirely of fat. There are also seen, but much less frequently, larger, smooth, bard masses of a yellowish-brown color, but white on section. They are generally present in small numbers in a stool, the rest of which may be quite normal. These hard or "bean cards," so called from their resemblance to lima beams, are composed chiefly of protein, usually with an envelope of fat. They are unlicibedly formed in the stomach, where the casein congulates in masses, some of which are so firm and hard that they pass the intestine without being digested. Curds of this description are rarely seen unless the proportion of casein in the food is high.

Cards of the first variety, if numerous, call for a considerable reduction in the amount of fat. The large, smooth, hard surds, if numerous and persistent, may usually be made to disappear by boiling the milk. This causes the precipitation of the casein to occur in smaller masses which are more readily attacked by the gastric and intestinal secretions.

Losser, Green, or Yellowish-green Stools of a Sour Order,—These are usually due to too much sugar, especially factorse, sometimes also to an excess of fat. The number of stools is usually from two to five duily. In appearance the stools resemble thin scrambled eggs. Stools such as those described are often seen in nursing infants as well as in those artificially fed, and the condition is not incompatible with steady and

regular gain in weight. After it has persisted any length of time, mucus is regularly present.

Large, Dry. Light-colored Stools.-Such stools are seen only if inlants are fed prependerately or entirely upon cow's milk. The bowels are constructed and the stools may not be passed oftener than once in forty-eight hours. They are relatively large, however, and are so dry that the Super may be hardly scaled. In addition, they are puttycolored or grayish-green and are very foul with the odor of putrefaction. On analysis they are found to be alkaline in reaction and to contain a large proportion of calcium and magnesium scaps. For a time, infants with such stools may improve and gain in weight. After a time, however, they cease gaining and eventually lase weight while anemia appears of increasing seventy and eventually a condition of tearnsmus may develop. To this condition the name mildwideschaden has been given by Carray, who believed that an excess of fat in the diet was responsible for it. It is probably due not so much to an excess of fat as to an insufficient amount of carbobrdrates. In the absence of this latter, putrefaction of the protein goes on unchecked. This accounts for the character of the stools. It is the insufficient amount of earlichydrates that is chiefly responsible for the synsptoms. Many infants may take diluted whole milk without additional earlier hydrate and never show such symptoms, but some are rapidly and seriously affected by the absence of carbolicdrates.

The condition is readily amenable to treatment. The indications are to diminish the milk of this has been in excess, and to add sugar alone or sugar and some creat. The mere addition of milk sugar or case sugar in the quantities usually given may be sufficient. At times, however, even when given in amounts up to the point of telerance, no improvement is seen. It is then advantageous to give a preparation of maltose in the form of one of the malt suspe, with wheat or barley flour in addition. The improvement is seen at once. The shools become acid in reaction, soft and brownish; the general condition shows a distinct amelioration and gain in weight again occurs.

No Gain in Weight without critical Symptoms of Indignation.—
This is sometimes due to too little or the weak food, the child assally manifesting signs of langer. Occasionally it is due to the fact that the food has been too concentrated or that too much fat has been given. In the latter case it frequently happens that the appetric is much reduced, so that the infant takes perhaps has then half his usual allowance. Too frequent feelings and the practice of constantly coaxing the infant to take more food often produce the same aversion to food. It is much better to offer food only at four-bour intervals and take away the bottle as soon so the child shows that he does not want more.

Modifications in the food to meet the indications afforded by more serious conditions than those here described are considered in the later pages devoted to Difficult Cases of Feeding.

THE APPARETS REQUISID FOR THE PREZERATION OF MILK AT House.-This includes a glass graduate, a glass or agule funnel, a cream duper, a pitcher for mixing food, feeding-bottles, a tall cup for warming the food, and a small re-bex. Other articles needed are milk super, rubber nipples, absorbent cotton, buttle-brushes, berax or boric acid, bisarbinate of sida, and an alcohol lump, an electric stove, or a Bansen lumer. The best style of bottle is that which can be most readily cleaned. The graduated estindrical bottles with wide mouths are to be preferred. The best nipples are those of plain black rulder, which slip over the neck of the bottle, and are not so thack as to prevent their being turned incide out for cleaning. Those with a long ridher tule going to the bottom of the bottle should not be used. In many places their use is prohibited by law. The hole in the nipple should be large enough for the milk to drop rapidly when the bottle is inverted, but not so large that it will run in a stream. New nipules should be holled; but the daily beiling of nipples is unnecessary. It seen makes then so soft as to be uncless. They should be russed in cold water immedialely after using and washed daily in soap and water. When not in use, nipples should be kept covered in a solution of borax or boric axid. Bottles should first be rinsed with cold water, then washed with het sout-suds and a bottle-brush. When not in use they should stand full of water. Before the milk is put into them they should again be placed in beiling water for ten minutes.

Dupornova you Francia,-The food should be warmed to about 100° E, best by placing the bottle in a tall potcher or cap tilled with hot water, not by youring the food from the bottle into a saucepan-The temperature of the food may be tested with a thermometer, or by powing a few drops upon the front of the wrist; it should feel warm. but not hot. The nurse should never take the nipple of the bottle into her own mouth. A bottle should not be warmed over for a second feeding. A child should not be more than twenty minutes in taking his food, and should not sleep with the nipple of the buttle in his mouth. It is preferable to have a young infant held while taking his bottle. If this is not done, the bottle should at least be held in such a position that the neck of the bottle is kept full. After feeding, the child should be held upright over the nurse's shoulder, and patted on the back, to allow him to bring up the gas, usually air which he has reallowed. He is then placed in his crib and left alone. It is commore necessary than in terms-feeding that rules as to frequency and regularity of much be observed.

DESCRIPTIONS FOR PREFAMING THE FOOD.—All the food needed for twenty-four hours should be prepared at one time. The first thing to be decided is the formula to be used; next, the quantity of food for twentyfour hours, lastir the number of feedings into which it is to be divided.

Let us suppose for example that the child to be fed is an average healthy infant three menths old, weighing about twelve pounds. Formula No. V of the series given would be an appropriate one to begin with. The food requirements would be furnished in about 35 owners. This amount should be given in six feedings. When more than 20 owners is needed for a day's supply the quantity of each ingredient should be increased; for 30 owners one-half more of each is used; for 35 owners three-quarters more; for 40 owners twice as much. Thus, using No. V, the quantities would be as follows:

	For 39 Outom	For III Owner.	Ear 35 Opens	For #0 Ounces
Whole milk	00 ox.	15 on.	1714 or.	20 on
Sagar	255 tabl'sp's	3% tabl'ep/le	417 tablespile	5 tabl'spile
Water	10 ox.	15 on.	1715 or.	20 on

When barley water or grard is used it replaces part or all the water in the formula.

The milk sugar should be dissolved in holled water, which is then mixed with the milk in a pitcher. The food is now divided into the required number of feedings and the bottles stoppered with cotton. They are placed at once in an ice chest, or first sterilized, then couled, and afterward placed upon ice.

Music Laboratorius.—Many of our large cities have milk laboratories which put up on the prescription of physicians milk for infant feeding containing any desired percentages of fat, sugar, protein, etc., raw or heated, and with the addition of any cereals when these are wanted. In his prescription the physician indicates simply the percentages he wishes, together with the number of feedings and the quantity for each feeding. The milk is delivered duily in the bottles from which it is to be fed, requiring only to be warmed. The milk laboratory is of much assistance in infant feeding, particularly when there is no one in the house who has the time, the facilities or the intelligence to prepare the food properly there. To one with experience in ordering milk by prescription the milk laboratory is a great practical aid. The laboratories are particularly useful in preparing milk for long journeys or ocean travel.

THE OBSERVATION OF CASES OF INPANT-FERRESO.—Attention to de-

tail is most essential. Much of the want of success in infant feeling is due to a failure of the physician to keep in close touch with the case. For the first few weeks to should see the infant every few days, impect the stools, hear the nurse's report, and see how directions are being carried out. When the child is well started and has begun to gain regularly in weight, a weekly visit may be sufficient. Still later, mouthly visits but with regular weekly reports in writing should be continued until the child is a year old and is taking whole milk and solid food. The weekly report should include answers to certain questions, vin.:

- 1. Weight: gain or loss since last report.
- 2. Stools: frequency and general character.
- 3. Vamiting or regargitation: when and how much?
- 4. Flatulence or colie?
- 5. Appetite: Is the child satisfied? Does he leave any of his food?
- 6. Is be comfortable and good-natural and sleeping well?
- The formula of the food new given quantity and frequency of feedbars.

An excellent plan is to furnish the mother with a printed form containing the questions to be filled out and returned. With information regarding the points inficated, it is possible for the physician to know pretty accurately how the child is doing, what changes, if any, are desirable in the food, and whether he ought to see the potient.

It is essential to success with any method of feeding, first, that one should have good raw materials—the freshest and cleanest milk obtainalde; second, that at least the fat soutent of the milk or cream used be definitely known; third, that directions for the mother or nurse be clear, explicit and in writing; fourth, that one have the cooperation of an intelligent mother or nurse; finally, it should be remembered that practical success in infant feeding depends upon how intelligently a method is used, rather than upon the method itself, and that the one indispensable thing is systematic observation.

The Use of other Food than Malk during the First Year.—Reference has already been made to the addition of farinaceous food in the form of barley water and other cereal gravia in the modification of cow's milk. These are useful in the first place for their mechanical effect upon cases coughlation in the stomach. For this purpose only a small amount of the cereal making a weak gravel is necessary, e. g., one or two tenspoonfuls of the flour to the daily food. Farinaceous food may also be given when, because low fats are used from choice or necessity, the carbohydrates should be increased. Instead of thing this entirely by some form of sugar, part of the carbohydrates may in many cases advantageously be furnished in the form of starch. This may be given as a gravel made from wheat, out, or barley flour, or arrowroot. The amount of the four used

in the daily food should seldem be over one-fourth ounce under three months of ago; from three to six mouths, from one-half to one and onehalf ounces may be given; from six to ten months, from one and onehalf to two ounces; all the above being by volume, not weight. The flour should be cocked for ten to twenty minutes in the water used for diluting the milk. If grains instead of flour are used the cooking should be for at least three hours and the gract should be carefully strained before using. After ten or eleven months ornal may be given with a spoon. This may be almost any form of well-cooked cereal which has been strained. It may be cooked with milk or the milk may be added. Beginning with half an same a day the quantity may be gradually increased to two ources twice a day. While many children easily digest the art outs of starch mendioned, there are others who are much disturbed by them, and some to whom, owing to flatulence and other symptons of intestinal indigestion, starch our not be given at all.

The only other things to be advised during the first year are beef faire and the juice of some fresh fruit. Beef juice may be begun in the ninth or teath mouth, earlier with anemic children; at first not more than two tempecufule daily, later the amount may gradually be increased to one ounce. The best fruit juice is that of the orange, which should be fresh and sweet. It may with advantage be given to all healthy infants eight months old, and to most when six or seven months old. Beginning with half an omce, the quantity may gradually be increased to two sunces daily, given preferably about one hour before the second milk-feeding.

The Tolerance of Healthy Infants for the Different Food Elements.

-In the foregoing pages we have indicated the propertions and amounts which, in our experience, have been shown in the majority of instances to he the best for feeding healthy infants. However, Nature will often tolerate quite wale variations from what is best. The desire for a rapid increase in weight often leads to an increase of the fat in the food much beyond the limits which are usually safe. There are some children of vigorous constitution and strong digestion, living in good surroundings, who tolerate this for a long time; some may even go through infancy to a period of mixed diet without any visible disturbance, and appear to thrive exceedingly well. There are others who hear for a considerable time very high proportions of carbohydrates and show phenomenal gains in weight. In both the conditions mentioned tolerance usually breaks down after a time, often from a trivial cause. This may be some intercurrent illness like a cold or a mild broughitis, or the advent of very but weather; or, sometimes even so slight a thing as deutition may bring about an uport of a most alarming character. In other children there gradually flerelop subarate or chronic disturbances of digestion and

nutrition which may last for months. One should be very cautions, therefore, in inferring that because a few infants thrive on unasual proportions or excessive amounts of some one of the food elements this is to be taken as a guide in feeding the average child.

FEEDING IN DIFFICULT CASES.

In the aggregate the number of infants included under the head of "difficult feeding cases" is a large one, and their management constitutes the most "special" branch of Pediatrics. The problem is often one of great complexity, the symptoms presented are of almost endless variety and even one of large experience often finds himself buffled. Let no one, therefore, expect to solve these problems without careful study of the individual cases and the closest attention to detail.

Cames.-In some of these infants difficult feeding is due to feeble digestion or some individual peculiarity because of which they do not thrive, even from the outset, upon the usual milk medifications although used intelligently. In a much larger group the cause is to be found in prolonged disturbances of direction, the result of previous improper methods of feeding. The difficulties are greatest in early infancy, in cities, in institutions, in hot weather, and they are further increased by the existence of constitutional debility, and when the trouble is of long standing. It is not infrequently found that the failure is due not to any fault with the food prescribed, but to other conditions. The food may be improperly prepared or given—s. g., it may be cold or given too rapidly; the bottles or nipples may be dirty; the proper quantities and intervals not observed, etc. Another factor of importance is the environment as affecting the nervous system of the infant. Among the well-to-do this may be the chief trouble. The constant or frequent excitement by vicitors, or playing with a child by purents or nurses, may result not only in lack of steep, but in disturbances of digestion, often in babitual comiting, though the food itself is proper. In such einconstances the removal of the child from its surroundings or placing him in charge of a competent muse will often cause an immediate and marked improvement without any change in the food. Another minor cause of disturbance is the habitual use of the "pacifier," frequently resorted to in these cases, but which should under no conditions be telerated.

That a prelonged disturbance of digostion in a young infant is a serious thing is often not appreciated. The mother is apt to think the problem one easy of solution; she "only wants to be told what to feed her buby," imagining that a single food prescription should set the child right at once. The physician box, sometimes, regards the condition lightly because these infants do not seem really ill; he therefore considers the subject hardly important enough for his careful, continuous attention. The fact should be supplessed that these cases are serious, that they are difficult, that in most of them nothing can be accompliabed without closs and continuous personal observation, that they do not tend to right themselves, and that infants' lives are often sacrificed as a result of bad management.

Clinical Types.—The greater number of these cases may be divided into three groups: (1) those whose chirf symptom is habitual veniting, or regurgilation of food; (2) those with intestinal symptoms, most frequently with loose stools; (3) those without any marked symptoms of indigestion, yet whose weight is much below the average, who do not gain on weak food and are upset if stronger food is used. They have feeble digestion rather than indigestion.

Cases with Vamiling.—The causes producing this are usually rather obvious. When cream and milk mixtures or top-milk mixtures are used, altogether the most frequent mistake is the use of too much fat. The amount used may not be more than many healthy children will take, but it is excessive for the particular patient. It is surprising how great the intolerance to fat is in some of these infants and also when once established how long it persists. Another frequent cause is the use of too much cone sugar, milk sugar, or one of the proprietary foods containing mallow or much starch. Other factors of importance are too frequent feedings, too much food and the use of unsuitable and indigestible foods. The comiting may also be the result of a neuropathic constitution. (Page 262). The condition may be a sequel of any of the neute infections and is more intractable in the secree of a swere constitutional disease such as rickets, applitts or tubercolosis.

With such severe and prolonged symptoms as are often present, pathological changes in the atomach reight be expected. These, however, are strikingly absent. The storach may be alightly dilated and there is usually a large amount of mucus present but macroscopically and even microscopically there are no important or even constant changes.

The most important symptom is comiting. It may occur soon or long after feeding. Some of these infants comit only occusionally and in large quantities; but it is more common for frequent regurgitation of small amounts of food to take place. This may begin soon after one feeding and continue quite to the time for the next. After a time, the comited matters nearly always contain muchs, and sometimes this is a conspicuous feature. The regurgitation of a sour irritating fluid occurs oven when but little food is ejected, and usually accompanies the belchnor of gas.

The results obtained in the examination of stomach contents have not iseen uniform, and in practice one should not lay much stress upon the absence of the normal secretions. The presence of mucus in the vomited nutters or in the washings from the stomach is nearly a constant feature. This greatly interferes with digestion, even though the secretions are normal. The reaction of the stomach is almost always acid. The hydrochloric acid is almost invariably diminished in quantity. Free hydrochloric acid is very solden present. There is usually a marked other of butyric and other colatile fatty acids. One would expect, therefore, to find these in excess, but the studies of Hubbachunsky have shown that they are little if at all increased in the stomach contents of vomiting infants. The remost ferment and popoin are almost invariably present in normal amount, hence the administration of digestive ferments is not indicated.

In addition to air which is smallinged, there is an increased production of gas. Some of the most striking symptoms are due to distention. The epigastrium may be tense and hard most of the time, and often so much gas is present that infants find difficulty in taking food. Though evidently hangry, they can take so little at a time that an hour or more may be required to take four or five ounces. There is motor insufficiency of the stomach and probably in some cases a certain degree of pylone spasm which causes gastric stagnation. That the food remains long in the stomach is best demonstrated by aspiration or stomach-washing. Instead of the stomach's being compty in two and a half or three hours, as it should be, food may be found four or five hours, and in some cases six or eight hours, after feeding. These may be dilatation of the stomach, especially in older infants who are rachitic.

The appetite may be abnormally great, or it may be poor. As a rule, children take less feed than in health. The tengue is usually coated. The general symptoms are those of malautrities; there is constant fretfulness, and sleep is irregular or disturbed; the weight is stationary, or there is a steady loss; there is also assemis, and the child's development is arrested. There is nearly always some derangement of the borrols, more often constipation than distribute.

Infants who vomit as the result of a neuropathic constitution may show at first no symptoms but the vomiting. If this is senere and continued, later they show evidences of malintrition, sometimes of an extreme grade.

There is little tendency to spontaneous improvement or recovery, the prognesis depending almost entirely upon the treatment employed. Unless relieved the condition is upt to continue, until some serious acute disease develops which may be fatal. In very young infunds such gastric disturbances should not be confounded with hypertrophic stenorie of the priorus.

In the treatment, the question of diet is of first importance. It is the chief therapeutic measure. The indications for tarying the quality and quantity of the food when there is habitual sumiting have already been discussed (page 193). The feedings should be at least four hours apart and the amounts smaller than normal infants of the same ago would receive. The usual practice when an infant suffers from vomiting is to dilute his food and, in some instances, this is perfectly proper; but to continue increasing the dilution because the patient does not do well may be the very worst treatment. Small feedings, not weak food, are what benefit some of these children most, the balance of the daily amount of water needed by the infant being given between the feedings. Unless cream or top-milk mixtures have been employed the sugar is more likely to be the exciting cause of the vomiting than any other ingredient of the food. This should be greatly reduced in amount or temperarily removed altogether. When the vomiting has coused the sugar may gradsally be increased. Milk sugar is less likely to ferment in the stomach than came sugar or multose. The latter should never be used with remiting infants. Buttermilk, on account of its low fat and moderate sugar. content, is frequently of value, but it cannot advantageously be continued very long without the addition of carbohydrates in some form. The very factors that make it of value for temperary use make it disadvantageous for permanent use.

Wet nursing does not bring immediate improvement in the remiting and sensetimes none at all. The large amount of sugar and fat in breast milk sensetimes aggravates the symptoms. Usually, however, the infant when breast-fed improves; but the ventiting may continue so severe as to make it necessary to return to artificial feeding. When the ventiting has ceased, however, assthing brings about such rapid recuperation of the general health as does breast milk.

At times, nothing succeeds so well as giving semi-solid food with the speen. Cereals cooked with milk as described on page 103 are readily borne by many infants, especially those with remiting due to nervous ranges.

Stomach washing is frequently useful, especially with persistent cases. It removes the mucus, cleaness the organ and arts as a stimulant to the gastric secretions, especially the hydrochloric acid. Plain boiled water, or a weak alkaline solution—solium bicarbonale, one dram to the pint—may be employed. In the early part of the treatment the washing should be done daily; later, every second or third day. The time selected is not of great moment, but it is better to make this about three hours after feeding.

The general treatment is apt to be ignored, but is important. The best possible hygiene should be accured,—a large, roomy nursery, and plenty of fresh air by night and by day; equally necessary are quiet surroundings and freedom from disturbing conditions which sometimes obtain in the nursery. General friction of the body is useful in delicate children with poor circulation. Infants must be properly covered, and it is of the utmost importance that the feet be kept warm.

Drugs have a very limited application in the treatment of this condition in infants. They have been too much used, and too little attention has been given to the details of feeding, by which means alone permanent improvement is usually reached. The continued use of pepsin and other digostice ferments is irrational and without benefit. Hydrochloric mid may at times prove of value, but it must be given in rather large doors,—i. e., five to fifteen drops of the dilute acid after each feeding.

Union with Intestinal Symptoms.—These are found most frequently in infants born prematurely, in those with constitutional debility, who have never been vigorous, in those brought up in poor surroundings with animalifigent care to in those who have suffered from any neute disease, especially inflammation of the gastro-intestinal tract, such as ileocolitia. Usually there has been artificial feeding from the beginning or after a few weeks of nursing. Some of the infants also belong to the neuropathic type. To the extent that it is usually avoided by maternal nursing, the condition is a preventable one. But there are a few infants that develop these symptoms even while nursing; and a considerable number, in spite of intelligent artificial feeding. There seems to be with these infants a particular lack of resistance on the part of the intestinal tract. It never seems capalle of accomplishing the work devolving upon it,

In infants led on top-milk mixtures, the most common cause of disturbance is an excessive amount of fat. When whole-milk modifications are used the fault is usually an excess of sugar, and with objer infants too large quantities of farinareous foods, often insufficiently cooked. The carbahydrates may not be more than the average child takes well, but these infants are particularly sensitive.

There are no constant or characteristic pathological changes. There may be a hyperplasia of the lymphoid tissue of the intestines and sometimes there is a similar process in the mesenteric lymph nodes. Usually, however, these are absent.

The symptoms are general and local. So far as the intestinal condition is concerned, diarrhea is the most frequent and serious symptom. It may happen that the same shild will suffer for a long time from diarrhea and then from constipation, but the constitution is usually the result of dictotic measures directed against the diarrhea.—i.v., a

reduction in the fat or the carbehydrates, or both. As a result, the energy value of the food is reduced to a point at or below the maintenance requirement. When, in order to produce gain in weight, these substances are increased in the food, durrhen again results. There may thus be ever long periods, alternating constipation and diarrhen. The steeds are of all varieties, depending on the severity of the symptoms and the character of the food. They are usually more frequent than normal and generally contain undigested food and micros. In some cases the steeds contain but hittle solid matter, the character being that of yellow-integreen water. The steeds usually have a sour, unpleasant odor, but are rarely very foul. They may be irritating to the skin and cause troublesome excentations and intertrige. There may be much gas and flatulence.

If there is constipation, the stock are usually gray to white; they are smooth and pasty like hard balls and pasted after much straining, often coated with mucus and constitutes streaked with blook. Such stools are not infrequently seen when the food contains a large amount of fat. With the constipution there may be much flatulence and colle, the attacks of which may be swore.

The general symptoms are those of malnutrition. These are more fully described elsewhere and need only be mentioned here. The most important are: stationary or falling weight, ancesia, poor circulation, often subnormal temperature, almost constant fretfulness and cryingwith very little quiet sleep. The tengue may be coated but more often is quite clean. The appetite is frequently good, these infants taking food whenever given, and in an almost unlimited quantity. There are few cases in which occasional coniting does not occur, sometimes it is marked and persistent, but it is sure for it to be so. When so much of the food is regargitated by comiting, as in the cases just described, the intestinal tract, even with highly errences methods of feeding, is thereby protected.

The duration of these symptoms is indefinite. Even with the greatest care there is little or no tendency to spontaneous improvement. They may drag on for many mouths with frequent exacerbations and remissions. The symptoms may be relieved, but at the same time to insure growth and a gain in weight may be, for the time being at least, well nigh impossible. The least increase in the food, especially the carbohydrates or fats, may be sufficient to precipitate an attack of diarrhea with further loss in weight. Thus, there may alternate slight gains and losses, the weight for months being nearly stationary.

A danger to these patients is that of intercurrent infections. To a delicate infant an attack of thinopharyngitis with ofits may be more serious than a frank preumonia to a vigorous child. Any infection is

to be feared, bronchitis and presuments particularly so. Death seldom results from the severity of the condition itself. With appropriate treatment a gain in weight usually results, although this may be delayed many weeks or mouths. With infants over six mouths of age the problem is usually an easier one than with those sounger. Especially is there difficulty with premature infants and those much under weight at birth, i. s., five pounds or loss.

Drags have no part in the treatment of these cases; in nearly every instance they had best be emitted altogether. The treatment is distetic. Prophylaxis is insportant, Maternal unusing will do much to prevent the development of such cases. It is necessary to obtain a careful and minute history in order to direct matters intelligently. The previous feeding should be thoroughly known, the different changes made and their effect upon the intestinal symptoms and the infant's weight. With this information one can often at once determine where mistakes have been made and in many instances it is found that the same metake has been repeated with each change of food.

Occasionally discribes develops with maternal nursing and it is by so means infrequent when, on account of a tendency to attacks of diarrhea, wet nursing to resorted to. The cauce of this is the large amount of fat and sugar in breast milk, both of which readily undergo change in the intestines with the production of irritating lower fatty acids. Breast feeding should not be interrupted under such circumstances but supplementary feeding with a food low in fat and sugar should be resorted to. The most available food is buttermilk. This may be given at alternate feedings or may be given in amounts of one or two sources just before the nursing. When the symptoms have been overcome, the buttermilk may gradually be withdrawn from the dietary. Breast feeding is altogether the safest method of treating such conditions in those infants under three months of age. Many of those older may be successfully treated by artificial feeding but progress, in order to be sure, must be slow. In pretracted cases minor variations in the composition of the food or in the plan of feeding rarely accomplish much. The most brilliant results are often obtained from as complete a change in the diet as possible. Notwithstanding the fact that these patients are usually much below the normal weight and often losing steadily, the treatment should be directed first of all to allaying the most marked intestical symptoms. Until these are relieved, no permanent improvement can be expected. For the time being, the weight must be disregarded.

So far as the elements of cow's milk are concerned, the greatest difficulty is seen when both fat and sugar are given in considerable amount. A moderate amount of fat with a minimum of sugar usually ranses no discribes. Sugar, however, even in the absence of fat, will produce it. For this reason, the use of skimmed milk and even fat-free milk usually causes no improvement in the discribes, there being too much sugar in fresh milk, even without the addition of any extra amount. Top-milk or milk and evens mixtures are not admissible. If fresh milk mixtures are to be used, dilations of whole milk or of partially skimmed milk should be given, with no cartchydrates added. If, upon this diet the stools become normal, sugar may gradually be added, but this must not be lactose or a mixture in which multose is present in a large amount, such as malt stop. The dry preparations of multose or one sugar should be at first fried and in small quantity, not over one teaspoonful daily.

If fresh milk mixtures are not well borne, buttermilk and other fermented milks may be tried. These succeed in a certain number of cases that do not respond to skimmed milk. It is seldom necessary to diffute them more than with an equal amount of water. Additional carbohydrates needed may, after a time, be supplied—best by adding starchy food with small quantities of case sugar.

Protein milk is one of the most valuable of the recent additions to our resources in feeding cases of this type. The chief advantages here are apparently due to its low sugar content, for it contains a considerable amount of fat, indicating that fat in the absence of carbohydrates is very frequently well borne. The large amount of protein which readily undergoes putrefaction inhibits the formation of the lower fatty acids from the carbohydrates and fats. Only for very young infants need it be diluted and it is seldom necessary to reduce the fat by making it from skimmed milk. Not much gain in weight is seen when protein milk is used alone. Carbohydrates should be added as soon as possible, but always with great caution, beginning with very small quantities. Cane sugar should first be tried, then one of the dry preparations of maltose beginning with not more than a half tablespoonful daily and slowly increasing.

Either of these argars may be used in conjunction with starchy food which may be wheat or barley flour from one-quarter to one ounce daily, the latter amount to children five or six months of age. Employed in this way protein milk may often be continued for two or three months, but without the addition of carbshydrates it is seldem advantageous for more than two or three weeks.

Poptonized milk has been altogether too frequently employed and offers no aid in the treatment of intestinal conditions. A change to a diet other than milk should be made very slowly and with great care; one relatively rich in carbobydrates is smully bully borne. Carbohydrates in the form of cooked cereals must be added gradually. Eggs are sometimes of assistance and junket is frequently of value in preventing excessive fermentation. Solicitous care should not cease with those children at the end of the first year, they must be closely watched until they are three or four years old.

The same careful hygiene is as important as in patients with gastric symptoms. The general methods employed should be the same.

Cases with Feeble Digitalism.—Infants whose digestion is very feeble, although they have nother pronounced gastric or intestinal symptoms, are very difficult patients to field. Gains in weight are very slow and one must be content if any regular gain takes place. In case of failure by the usual milk medifications, wet-nursing is altogether the most successful form of feeding. Sumetimes at is sufficient if only partial breast feeding can be given, i. s., three or four feedings a day. This is a plan of much value in institutions and saves many behies. If no breast feeding is possible, artificial feeding must be conducted in the most painataking manner lest serious digestive uports occur. If these can be avoided it usually happens that as the child grows older and a more varied dist can be given, the problem grows stendily easier.

With some infants, in the event of failure by the usual methods, the first start, which is really the most difficult one, may be made upon sweetened condensed milk which is diluted with plain water or barley water. "Evaporated" or unsweetened condensed milk has at times sue couled when fresh whole milk has failed. The suplanation for this cannot be given. Unsweetened condensed milk requires the same addition of sugar and starch as does whole milk.

When there is no vomiting and no tendency to diarrhea, feeding with considerably higher proportions of carbohydrates than are usually employed is also sometimes neefel for a short time. It may be carried out with fresh milk as in the various mult-soop mixtures, or with sweetened condensed milk or evaporated milk as a basis. When an excess of curbohydrate is given the percentages of fat and protein, but especially the former, should be latter than in the usual formulas for the age and condition. There is apparently some advantage in using a variety of sugars; a combination of lactore, maltose and cano sugar being given rather than any one of them alone. The total sugar may sometimes be carried above 7 per cent but always with caution. Starchy food is added in the form of barley, wheat or out flour, cooked for ieu to twenty minntes. The daily quantity used may be from balf an ounce to two ownces seconding to ago and condition. The larger quantity mentioned may sometimes be given to an infant of five or six months. With infants over six months of age thick grad like that advased for normal infants of ten or tweive months may be of great noistance in causing gain in weight.

A diet containing an excessive amount of carbohydrate is not adapted to prolonged use and incantionedy used may be followed by serious upacts. For a time all may go well; then from some apparently trivial cause a breakflown occurs. As soon as possible the shild should be placed upon a more rational food, i.e., a properly "balanced ration" by introducing at first one and then other feedings from whole milk modifications in which fat and protein are raised and carbohydrates reduced.

A foodstuff occasionally useful is often oil. It is a form of fat which can semetimes be tolerated when the fat of you's milk habitually disagrees. The amount used at first should be small, not more than one-half beaspoonful twice a day. The maximum amount to he used for infants of the first year should not be over two tenspoonfuls daily.

The chief means by which weight can be increased in children suffering from malnutrition is therefore through the addition of carbohydrates, especially maltose, as soon as these can be telepated; next by the addition of fat, but neither of these is to be employed in any considerable quantity until the marked symptoms of indigestion have been controlled.

CHAPTER IV

FEEDING AFTER THE FIRST YEAR

HEALTHY INFANTS DURING THE SECOND YEAR.

The physician should not relax his vigilance in the feeding of a child after the first year has passed. The ideas of the faity in regard to what is proper for a child after be has outgrown an exclusive milk diet are very erronesses. Most of the disorders of digestion of early childheod are directly traceable to dietetic errors. Among the poor the majority of infants are given solid food too early, in too large quantities and improperly prepared. Among many of the intelligent and well-to-do the disposition is to go to the opposite extreme and to keep the infant too long upon a diet composed exclusively or almost exclusively of milk.

During the second year the dict of a healthy child should consist chiefly of milk, bread, farinaceous foods, fruit juices or cooked fruit, with a small amount of animal food in the form of beef juice, broths, meat and eggs. By the middle of the year with most children, with some even sartier, potato may be added, also green regetables, at first in small quantities, thoroughly cooked and purical.

Milk should be the largest item of the diet, but when solid food in any considerable quantity is begun it should be reduced; few children require more than a pint and a half of rook a day. The popular notion that there are many children who cannot take milk is an errorsous ere; the real trouble usually is that too rich milk is given or that the quantity allowed is too large. It is often drunk like water with a hearty meal of other food and the child is simply overfed. On the other band, to permit a child to give up milk altogether because solid loss! pleases the palate better is a mistake. It is important, however, that the transition from an entirely fluid diet to one of solid had should be made gradually, and that the liabit of taking milk should not cease at the end of the first, or even the second year.

During the second year with average milk and average infants no modification of the milk is required. If the milk is very rich, such as that from a Jersey berd, it should be partially skimmed or diluted with at least one-fourth water. In hot weather especially should these measures be invisted to:

B'essing from the Bottle.—This should always be begun before a chald is a year old; by the thirteenth month an infant should take all his milk from a cup, except possibly the 10 x, u, beeling, when for the sake of convenience the bottle may be allowed. Early wearing from the buttle is a matter of no small importance. When the bottle is allowed to older children the temptation to overfeeding, especially during the summer, may be very great. Again there are many children with the "bottle-habit" so firmly developed that throughout childhood, although at any time ther will take milk from the bottle, they can never be induced to take it any other way, and sometimes refuse all other food so long as the bottle is allowed.

From Twelve to Fifteen Months.—The daily schedule at this period should be about as follows:

- 6 to 7 s.m. Milk, six combrs, diluted with two to three centers of barley or not
 - 9 a.M. Orienge julice, one to three mades
 - A.M. Cercal (thoroughly moked and strained), one large tablespoonful. Milk, an outnos, part of it on ternal.
 Crisp, dry toast, one piece.
 - 2 r.m. Beef juice, one to two cuscos; given vegetable; one or two imageouslide: or, scriften or chacken broth, there to four cuscos;
 - or, one-half, later one entire soft eng-
 - Croy, dry fourt or unwestened receback, one piece.
 - Milk and good in the proportions given above, four to six ounces.
 - 6 P.M. Same as at 10 AM.
 - 10 r.m. Same as at 6 a.m., but given from a bottle.

In preparing the food, the milk and the grael are simply mixed together while the latter is warm; salt and at first a very small quantity

of care sugar are added to make it pulatable. It is then divided into as many feedings as are required for the day, each one being placed in a separate bottle. As to building the bottles and pusteurizing or sterilining, the same rules apply as during the first year.

From Fifteen to Twenty Months.- The diet may be increased by the

addition of more solid food. The average child will require:

530 AM. Milk, warmed, eight sunces.

2 s.m. Orange juice, two to three suspen.

10 A.M. Cercal, two good tablespoonfuls, notineal or hominy, cooked three hours, not musicol, with one ounce of thin cream or top-mik. Milk, six causes.

Crup tout or swieback, one or two pieces.

2 P.M. Beef juice and two tempeondule of arraped ment;

or, broth, ferr reason, and one ope.

Oze-half of a hazed putato;

or, one tablespoonful of a green vegetable (spinuch, carrota, fresh pean, string beams, asparagon tiget thoroughly cooked and put through a fine sieve.

Street prince, three or four;

or, one-half a baked apple, studied.

Crisp tout or dried bread.

P.M. Gereal, two tablespacedule, farms or cream of wheat, cooked one hour, served as at 10 a.m.

Milk, right ourses.

10 r.m. Milk, six outers (smitted at eighteen morths and sometimes earlier).

From Twenty Menths to Two Years.—By the end of the second year the amount of the solid food, especially the quantity of most and eggetables, may be somewhat increased. The meat allowed may be finely minced or symped beefsteak, lamb chop or chicken. Only four meals should be given, the 10 P. M. feeding being amitted, and nothing but mater between the feedings; this, however, should be allowed freely. Raw fruit except orange juice should not be given. It is usually better to give the fruit and milk at different meals. It is often more convenient to transpose the morning feedings, giving the milk at 10.39 and the prinsipal meal at 7.50 or 7.30 a. M.

FEEDING FROM THE TRIRD TO THE SINTH YEAR

Articles Allowed .- From the following list the doct of a healthy child

may be arranged.

Milk.—This should form a prominent part of the diet. No child requires more than a pint and a half (three glasses) daily. Rich Jersey sulk should not be chosen. The milk should nearly be given warm. Create.—Not more than three or four centees of thin (16 to 18 per cent) cream should be given daily. It should not be used upon fruits, especially sour fruits. It may be used upon cereals, upon potato and in broths. Cream should not be given at all to children who suffer from sa-called billions attacks, with conted tougue, had breath, etc.

Eggs.—They should be fresh, soft-builed, pouched, coddled, or scrambled, but not fried. Children vary greatly as regards their ability to digest eggs; many children will take two eggs a day, some only one, and a few can not take them at all.

Meals—Some form of meat should be given not more than once a day. The best are beefsteak, lamb chop, and reast beef or lamb and the whole meat of chicken; next to these certain delicate fresh fish boiled so broiled. Heef and lamb should be zero. All means should be finely divided; cold means should be grounded as children do not chew them well.

Fegetables.—Potate may be given once a day, baled or mashed, with the addition of cream se leed juice rather than butter. Of the vegetables the best are asparagus tips, spinach, strend colory, string beans, carrets, "put-greens" and fresh peas. One green vegetable at least should be given daily—always well coaked and mashed.

Cercols,-The "dry" or rendy-to-serve cereals should not as a rule be

CALORIC VALUES OF COMMON POODS

Ontonia (rended) Ontonia Facility Facility Marian	Variation	Eyes Tablespil 10 10 12 17 13 13	Head juice Breath Create Neap Create Organization	Oute on State
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In ordering a diet for children a knowledge of the nutritive or calonic value of the different common articles of diet is highly desirable.

As estimated in the table, vegetables are finely modirel, meats are finely divided and even table-possible are tablely parked.

Certain are conked in water in proportions given on the parkage, i.e., extended one map to water one pint.

given to young children. They are the cause of more disturbances of digretion than almost any other common article of dict. Almost any cereal which has been thoroughly cooked may be allowed—estimal, wheaten grits, hominy, rice, comment, farma, and arrowroot. If the grains are used, cereals should be cooked from three to an hours, after having been previously staked. The partially cooked cereals of the shops should always be rooked two or three times as long as the directions upon the package. The "fireless cooker" is an excellent device for the proper cooking of cereals for children. Cereals should always be well salted, and given with milk or cream, but with little or no sugar.

Broths and Soups.—Both meat and vegetable soups may be given and nearly all varieties of the latter except tomato soup. Plain broths are not very notritions, but when thickened with arrowrest or cornstarch, and when milk is added, they are very palatable, and at the same time a valuable addition to the diet. Most vegetable puries are useful, and when properly made very digostible. Beef juice may be used as directed for the

second year.

Bread and Biscuits (Crackers).—In some form these may be given with nearly every meal, butter being added after the second year. All varieties of bread may be allowed when stale—i.e., two or three days old: also dried leveld, zwieback, and catmoul or gluten crackers.

Descrip.—The only once besides cooked fruits that should be allowed up to the sixth year are junket, plain custard, rice pudding without raisine, and, not oftener than once a week, see cream. Of the last three,

the quantity given should be very molerate.

Fraits.—Some fruit should be given to most healthy stalders every day. Oranges, baked apples, and stewed prunes are the most to be depended upon. Baw apples should not be given in most cases. Peaches, pears, and grapes (with seeds removed) may be given when thoroughly upon and fresh, but only in moderate quantity. The pulpy fruits should be given to young shildren only when cooked. Much indigestion is produced by too much fruit or improper fruits. Special care should be exercised in the use of fruits in very bot weather, and in cities when they may not always be fresh. The juice of fresh berries may be given in the second year; but the whole fruit should be very sparingly given to all young children, and always without cream.

Articles Ferbidden.—The following articles should not be allowed children under four years of age, and with few exceptions they may be

withheld with advantage up to the seventh year:

Meals.—Ham, sausage, pork in all forms, salt fish, corned beef, driedbeef, goose, duck, game, kidney, liver, meat stews, meat dressings and cold meats.

Vegetables.-Fried vegetables of all varieties, calduge, raw or fried

onsome, new celery, radiobes, lettuce, cucumbers, tomatoes (raw or cosked), beets (unless they are very small and quite fresh), egg-plant, and green corn.

Bread and Cabe.—All het bread and rolls; buckwheat and all other griddle takes; all fresh sweet cakes, particularly those containing dried fruits and those heavily iced.

Decerts,—All buts, candice, pies, taris, and pastry of every description; also all salads, jellies, syrups, and preserves,

Brinks-Tea, coffee, wine, beer, eider, and soon water,

Prairs.—All dried fruits unless steamed or stewed; lunanes, unless baked; all fruits out of season and stale fruits, particularly in summer.

From the third to the sixth year four meals should usually be given daily and at regular intervals—r.g., 7 and 10.30 a.m.; 1.30 and 6 r.m. The second rueal should be a small one.

There are a few simple rules in Iceling which should always be followed: A child should be taught to cut slowly and thoroughly masticate his food. The food must always be very finely divided, for mastication is very imperfect even up to the sixth or seventh year. It is unwise continually to urge children to cut when they are disinclined to do so at the regular hours of meals, or when the appetite is habitually poor, and in no circumstances should children be forced to cat. Indigestible articles of food should not be given to trough the appetite when ordinary simple food is refused. Food should not be allowed between meals when it is habitually declined at mont-time. If a child refuses to cat, and examination reveals no fault with the food prepared, it should seldom be offered again until the next feeding time. In all cases of temporary indisposition, no matter of what nature, and during periods of excessive heat in summer, the amount of solid food should be refused and more water green. If milk is the food, it should be diluted.

FEEDENG DURING ACUTE HANESS

Infants.—Feeling is an important part of the treatment of every arms disease in childrend, but especially so in infancy. Unless the illness is due to disease of the digestive tract, all cases must be fed in about the same way. It is much easier by proper feeling to prevent disturbances of digestion than to allay them. In infancy this complication often turns the scale against the potient. In every severe acute illness, especially if it is of a febrile character, the power of digestion is much diminished. One evalence of this is the cases with vomiting; another is the american which accompanies the early stage of nearly all acute discuses. We should respect this disinchination and make it our guide in the treatment. But water is needed; withholding this will often cause the temperature to rise even higher than before.

In all neute febrile discuses the general rule should be, less food and more water than in braith. For bottle-fed infants this is easily accomplished by simply increasing the dilution of the food; for mining infants by making the nursing time shorter and giving water freely between feedings either from a speen or bottle. During febrile rendstions, fat, especially, is builty borne, and this should therefore be reduced more than the other elements of the food. The dist should consist largely of carbobuffrates.

Regularity in feeding is too often entirely ignored. While it is true that with some capticious children all rules must be disregarded, it is with the great majority a decided advantage to adhere to proper food and regular intervals. Food should never be given at less than threehear intervals, although there is no limit to the frequency with which water may be given, and unless the stomach is irritable, almost no limit as to quantity. Stimulants, when required, are often best given in a very dilute form with the water.

Forced Feeding—Gauage.—Not a few cases, however, are seen in which, after a child has been several days sick, in consequence of delirium, stupor, sepsis, or some other serious condition, he may refuse all food or take so little that he is in danger of death from insmition. At this juncture forced feeding or gavage serves an excellent purpose. Both feed and stimulants can thus be introduced at regular intervals with slight disturbance, and lives saved which would otherwise be lost. If gavage is employed, the stomach should be washed at least twice a day. The latervals of feeding should be made at least one hour larger than is customary in health. Forced feeding is not applicable to chronic conditions.

Other Children.—The same conditions with reference to digestion exist as in the case of infants. Other patients, however, are not so easily disturbed, and the disturbance of digestion is not so likely to be serious as in the case of infants. Even here the physician should direct the food to be given at regular intervals, not oftener than every three hours, and should never—as is so often done—order that milk be given the child every time be asks for a drink. In most cases, for children under five years old, milk should be somewhat diluted. Children who do not take milk readily may be given heef too, health, grand, thin custard, or knows, and accasionally plain toe cream, but this, if given in any considerable quantity or very often, as likely to disturb the storage and take away what little desire for food the child may have. How eggs are pulatable when beaten up with a little sherry, super, and cracked ice-Fruits, especially orange and grape juice, may be allowed in almost every febrile disease, but not given within two hours of a milk feeding.

The water given may be plain boiled water, but often better, are some of the carbonated waters, Vichy, Seltzer, or Apollinaris, these being less likely to distort the elements.

It is certainly a mistake to force food upon older children in any duesse in which their condition is not dangerous. But when there is sepsis, delirium, or rema associated with other dangerous symptoms, gauge may be resorted to with but little more difficulty, and with no less satisfactory results, than in infants.

IDIOSYNCRASIES TO FOODSTUFFS

It is only in recent years that there has been demonstrated an idiosyncrasy on the part of some children to certain foodstuffs, in all probability to the protein of the foodstuffs and to this alone.

The most conspicuous example is the proteins of egg. Some children are so sensitive to egg proteins that the most minute quantity taken internally or even applied locally to an abraded skin will produce the most marked symptoms. The local symptoms, if taken by month, are a horning sensation of the murous membranes followed by marked congestion and smelling, which is sometimes so severe as to suggest that an irritant potent has been swallowed. The general symptoms which follow almost immediately include persistent vomiting, profuse discribes and marked prostration. These are often threatening and may be serious, although they usually last but a few bours. With these severe cases a marked cosinophilia is often present. Not only may there be symptoms referable to the gastro-intestinal tract but sometimes dyspace which resembles an attack of spasnedic asthma. The above symptoms represent the more severe form of this susceptibility. There is a much larger number of children who show this sensitiveness in a molder form, often only by repeated attacks of weniting after the ingestion of egg. Such a susceptibility is frequently lost during childhood but may persist to adult life to such a degree that the most minute quantity of egg taken in any form whatever is immediately followed by a disturbance.

Very much less frequently similar symptoms may follow the ingestion of cow's milk. We have seen two infants in whom less than ten drops of fresh cow's milk produced symptoms of a severe form. Such a condition, bowever, a extremely rare, and to attribute to milk idinsymprasy the common disturbances incident to artificial feeding is quite improper.

In older children a similar sensitiveness is seen to certain cereals, particularly to eatmeal and backwheat, and also to certain note, especially should and walnuts. In still others an extraordinary sensitiveness to truits, usually new fruits, is seen. The most frequent example in the

familiar enceptibility to atrawberries, loss often it may be to raw apples. In most cases the disturbance amounts only to an attack of articaria. Occasionally in the more enceptible the digretive disturbance above noted are also present. Similarly, but less frequently, other raw fruits, grape fruit, eranges and burnins, may cause symptoms. Certain shell fish, such as crabs, oveters, etc., may produce similar symptoms.

From clinical observation alone many erroneous conclusions are apt to be drawn. The absolute perof of such sensitiveness, as has been indicated, is afforded by the cutaneous reaction which follows the application of the pertein of any of the substances mentioned. The application of such tests is a matter of somewhat difficult technic and its use is only possible in the hands of a trained observer.

ACTINOSIS.

For the preservation of health it is necessary that the body should always contain an excess of bases, in order to maintain that degree of alkalimity in the fluids of the body with which the various functions are carried on to the best advantage. This degree of alkalimity is maintained under normal conditions with wonderful constancy even though there is a continuous staboration of soids such as sulphuric, phosphoric and carbonic in the organism. The acids are neutralized and removed from the body by a three-fold mechanism:

- 1. Carbon dioxid is given off from the lungs.
- The kidneys are able to exercte an acid urine from a slightly alkaline blood. The alkali spared is available to neutralize more acid or to assist in the renewal of the alkali reserve of the bedy.
- Ammenia is formed which is equable of neutralizing acid. The ammonia is formed at the expense of area, a neutral substance, and thus represents a clear gain of alkali for the body.

There is a normal preponderance of alkali over acid in the fluids of the organism. This depends upon the maintenance of an alkaline reserve, very largely bicarbonates, which is found in the blood, tissue juices and cells of the body. So long as the eliminating mechanism for the excretion of acids is preserved the alkaline reserve is not affected, even though the production of acids may be greatly increased. When acids are produced in excess or their elimination is interfered with, the normal proponderance of hases over acids is disturbed and acidsuis results.

It is apparent that acids such as those of the acctone series may be formed in the hody in considerable amount and yet be excreted without, affecting the alkaline reserve. The acids are neutralized by alkalies that can be replaced by those of the feed or by amusons. Under such conditions there is no acidosis. When the production of acids is so great that they cannot be neutralized without diminishing the reserve of alkali, acidesis may be said to be present. The dividing line between the two conditions is a very narrow one.

Acadesis may result from the production in excess of acids that are present in small amount in normal metabolism, such as aceto-acetic and \$\beta\$ exploityric acids. These acids are not directly poisonous but produce their injurious effect by depriving the body of sikals. They are present chiefly in diabetes and cyclic vaniting.

Acidosis presumably may result from the failure to excrete acids formed only in normal amount. It is conceivable, but not yet proven that acidom may result from the abnormal low of bases.

The means for the detection of acidesis are shiefly those flat deternance a diminution in the bicerbonate or in the total alkaline reserve of the blood, surong which may be included the determination of the earlier dioxid in the absolut air, a change in the reaction of the blood, the presence of acide (such as those of the acetors series) in excess in the blood or some, an increased tolerance for alkalies, or an increased anments in the urine which is evidence of the attempt to neutraline an excess of souls.

The methods of treatment are discussed under those diseases in which acidesis is found.

CHAPTER V

THE DERANGEMENTS OF VUTRITION

Inacition Marasana Molestrilian

This decompanients of nutrition, especially those accompanied by a loss of weight, form a distinct and a very large class in the allments of infancy, particularly during the first year. The symptoms are often definite and characteristic, and for this reason have frequently been considered and discussed as separate diseases. They are rather the result of several different factors and usually represent terminal stages of functional or organic disease. In adults such symptoms are usually seen in connection with organic disease. Three cases are often very purching, and in a large number of them a diagnosis of some constitutional disease, such as hereditary applicits, or tolerculosis, or organic disease of the domach or intestines, is erroneously made. The essential condition in all these cases is the mobility of the infant to get from his food what his system needs. He can not direct or assimilate energy to support life. He is unable to replace from his food the daily waste of

his tissues. The constructive metabolism is imperfect; the process is, therefore, essentially one of starvation, which may be rapid or slow according to circumstances.

The fault in these cases may be with the constitution of the child, with the organs of digestion, or, what is more generally the case, with the food. The problem is to adapt the food to the individual child under consideration. The solution is often very easy at first, but the difficulties multiply rapidly the longer the condition has lasted. It is therefore essential that the true explanation of the symptoms should be recognized at the earliest possible moment. Changes occur so rapidly in very young infants that a morake in diagnosis and a consequent delayof a few days may be sufficient to determine a fatal result. The outcome in cases of imperfect nutrition depends almost entirely upon their management. The condition is not one which tends to right itself. Spentaneous improvement or recovery rarely takes place. Not only is careful observation of the child and his symptoms important but also close attention to the body weight. A child whose nutrition is a matter of difficulty should be weighed regularly, in the early months at least twice a week, and once a week throughout the first year. If this is done, the first signs of failing autrition are unerringly detected. If an infant does not gain in weight something is wrong; a shooly loss in weight is a warning which should nover pass unbeeled; for, unless the conditions are changed, it is practically certain to continue, and generally with increasing rapidity until the vitality has been reduced to such a point that no means of treatment can restore it. The younger the child the more rapid the less, and the leager it has continued the greater is the danger.

Acute Inantition.—Rapid loss of weight, frequently spoken of as acute inantition, is common in early infancy, when it often simulates serious organic disease. In older children it is not frequent, and usually is dependent upon some obvious cases. In all the acute diseases of the digestive tract many of the symptoms are due to inantition. The obscure cases are those in which the digestive symptoms, strictly speaking, are not prominent.

The rapid loss of weight usually takes place under one of the following conditions: (1) When a child refuses all food, whether from the breast or the bottle, or can be made to take only an insignificant amount. The cause of this it is often impossible to discover. Symptoms of inanition are semitimes seen at wearing, when a child persistently refuses to take food from a bottle or spoon. (2) When the food given is entirely implequate, as when an infant is nursing upon a dry breast, or one ipwhich the milk supply is so scanty that the child gets practically nothing. It is recusionally seen later, when the breast-milk, for some uncaptained russes, smillenly finite. (3) When the character of the feed is improper. On account of extreme poverty, the infant may be getting only ton or toust coaled in water or albumin water. It may seem in paints infants who are fed entirely on starchy foods. (4) When the infant at both has such feelile powers of digostion, because premature or delicate, that he is mable to take or to digost sufficient food to maintain life. (5) When a sudden change of food is made to one so difficult of digostion that the child is unable to assimilate it. This may happen after sudden weaming. In such cases the symptoms of inamition are mingled with those of acute indigestion, but the former usually predominate.

The mode of development depends upon the antecedent condition. In young infants acute insuition often follows malnutrition, when perhaps there has been nothing noticeable except a gradual loss in weight; or, if the weight has not been watched, it may be observed only that the infant has not been doing well. Severe symptoms may come on quite enddenly, and if the nature and the gravity of the condition are not appreciated the case may terminate fatally in two or three days. The loss in weight is rapid, amounting often to three or four ounces a day. The temperature in the newly-horn may be high, but it is more often subnormal. The pulse is weak and may be rapid, but is at times very slow. The heart sounds are feeble. The urine is scanty. The extremittes are cold, and the peripheral circulation poor. There is usually conplete muscular relaxation. This is especially marked in the abdomen where the muscles almost entirely lose their tone. The skin may be dry or covered with a clammy perspiration. There is extreme pullor, and often a peculiar bluish-gray color to the face. This is always a grave symptom. Cyanosis may be present in children who have previously eried well and in whom there is no suspicion of atelectasis. The respirations are rapid and may be irregular. There may be constant worrying and fretfulness, or a condition of semi-stuper, in which the child makes no sign of wanting food. The fontanel is sunken and the pupils are contracted. The bowels usually move frequently, although there may be constinution, due to the small amount of food taken. When no food is taken for two or three days the stools may resemble meconium.

The progress depends much upon the age of the infants. Those under one month usually suscensib quickly. In them the symptoms sometimes but but a few days, seldom more than a week or two. The development of such symptoms in a young infant is a very serious sign. In older infants the progress downward is usually less rapid.

The outcome of such cases is, however, always uncertain, but with proper treatment many may be saved. It is hard for one who is not familiar with the condition to appreciate the great and even the immediate danger in which a young infant may be from manition, notwithstanding the absence of both comiting and diarrhea. The treatment must be

immediate and energetic. Breast milk is essential. There is no apporlimity to experiment with artificial feeding. No food can be given if there is vomiting or severe diarrhea, but in the absence of these breast milk may be given by gavage if necessary. The intervals should be long-at least four hours. In the event of no vomiting but diarrhea, buttermilk may be given, alternating with the breast milk. If it is impossible to obtain breast milk, buttermilk is probably the best form of diet ruless the child is over three months of age, when feeding with protein milk may be attempted. Rectal feeding is of no avail. Often the symptoms are largely due to a lack of water. Injections of a normal salt solution should be given per rectum or under the skin. Hypodermoclysis is often of great value. Absorption is usually prompt. The repolity with which shrivelled tissues will drink up water is actualshing. Normal saline solution should be employed in amounts from 150 to 240 c.c. ones or twice a day. This may be repeated for several days. While the improvement following hypotermodysis is frequently marked, it must be remembered that the effect is only temporary. Unless proper feed is retained and absorbed or the digestion improves, the conditions are soon as bad as ever and subsequent injections produce less and less affect. Saline solution may be given by the drop method into the rectum. This method is seldom satisfactory. Transfusion, by the direct or indirect method, may be life-saving. Energetic stimulation by caffein at camphor, hypothermically, is indicated. Except for the stimulants, drugs are of no use whatever.

Marsamus.—Gradual and progressive loss of weight, wasting, in a symptom of many conditions in infancy. It occurs in taberenlosis, in infantile syphilis, and also as a result of obvious disturbance of the gastrointestinal tract. At times, however, it appears to be a vice of nutrition only and develops, so far as can be made out, without general or local organic disease. To this type the natices of Marsamus, Infantile Afrephy and Simple Wasting have been applied.

This condition is not very often seen in the country or in private practice; but it is frequent in dispensary practice in all large cities, and is especially common in institutions for young infants. In such institutions, fully half the deaths under one year are directly or indirectly from this cause. It is a very large factor in the immense infant mortality of large cities in summer. Although the cause of death is usually reported under some other name, the determining factor in the fatal result is the previous marantic condition of the patient. The primary cause may be a congenital weakness of constitution which may depend upon heredity. It is often seen in premature children. In the cast majority of cases, however, it depends upon two factors—the food and the surroundings. Among the poor who live in tenements, many artificially-fed infants do

very hadly. This is due to neglect, to ignorance in regard to proper infant feeding and inability to procure what the child requires, especially pure con's milk. A country infant may be neglected in many respects, and is often bully feel; but he has plenty of pure air, and usually thrives. In the city, as long as an enlant has a plentiful supply of good breast-milk be continues to do well in most instances, in spite of the fact that his surroundings are lest. When there are not only but feeling and unhealthful surroundings, but also an inherited constitutional vice, we have all the factors required to produce managemen in its most marked form. The odds are so against the infant that the feeble spars of vitality flickers for a few months only and gradually goes out.

Another prominent factor in the production of marassens is the overerowding and lack of individual care of infants in institutions. Even though artificially fed in an intelligent manner, many infants who are plump and healthy on admission, lose little by little, until at the end of three or four months they become wasted to skyletons, dying of some mild scute illness, such as an attack of bronchitis, the assential cause, however, being manusmus. The common mistake is that of placing too many children in one word with no chance of obtaining a proper amount of fresh air and with too little individual attention. No house-plant is more delicate or acceptive to its surroundings than is an infant during the first few months of life.

The post-current findings in such cases are exceedingly unsatisfactory, and three little if any light upon the cause of death. Every new and then general inherentosis is discovered in patients dying apparently of marasavas, the existence of which was not previously suspected. An occasional lesion is fatty liver. This may lead to such enlargement of the organ that its weight is increased by one-half. Both to the naked eye and under the microscope the usual changes of fatty infiltration are present, often to an extreme degree. In the just too much has doubtless been made of this condition of the liver in marasanus. From figures given showhere (see article on Fatty Liver), it will be observed that the besion is not more frequent in this condition than in infants dying from other diseases. Its exact relation to the condition of wasting has not get been determined.

With these exceptions the autopoint show nothing striking. In the stormach and intestines there is nothing of pathological importance. The theory advanced, that strophy of the intestinal tabules is the explanation of management, has found little support.

The condition seems rather to be a failure of assimilation, owing to imperfect digestion, improper feed, unhygienic curroundings, or feeble constitution. As a result, there is a progressive loss in weight, feeble risculation, imperfect lung expansion, lowered body temperature, and, finally, a condition incompatible with life, for resistance becomes so feeble that the slightest functional disturbance proves fatal.

The general history of these cases is strikingly uniform. The following is the story most frequently told at the hospital: "At birth the baby was plump and well neurophed, and continued to thrive for a month or sit weeks while the mother was nursing him; at the end of that period



Fig. 18.—Managers; a Partier of the Hanne' Honoral, The Mooran One, Western fex Person. Weight at both reported to have been time pounds.

currentstances made wearing necessary. From that time the child ceased to thrive. He began to lose weight and strength, at first slowly, then rapidly, in spite of the fact that every known form of infant-food was tried." As a last resert the child, wasted to a sheleton, is brought to the hospital.

The most constant symptom is a steady loss in weight until a condition of extreme wasting is reached, at which point these patients may tenam for many weeks. Their general appearance is characteristic. They have an old look; the skin is wrinkfed, has but its tone, and bases in folds upon the extremities (Fig. 18). The logs are like drumsticks; the abdomen is prominent; the temples are hollow; the fontanel is sunken; the eyes large; the features sharp; and the hands resemble hird-clave. Often the children are reduced inertally to skin and benes. Anomia is a very marked and almost constant symptom. Accidental heartmarmores are frequently heard. The body temperature is usually subnermed unless artificial hear is employed. A rectal temperature of 95° or 96° F, is very common, and one of 93° or 91° E, is occasionally seen. In addition to the pollor of the face, there may be a leader hue.

A not infrequent symptom a general ofessi. The first thing which calls attention to this is often an mexpected gain in weight which may amount to several somes a day. The edema may increase until the cellular tissue of the entire body is water-logged. There are not, hereever, effusions into the large serous cavities. The stact pathology of this materianal edema is not clear. It is of quite frequent occurrence in cases of marasmus, especially in infants make six months of age. It seems impossible to connect it with any definite form of feeding. Thus, we have seen it in infants kept for a long time upon barky water, in others who were receiving nothing but condensed milk, in still others who were taking a milk formula apparently of suitable proportions. The tirine in the marked cases shows neither allsamin, nor casts, but aveally an almost complete absence of chlorids. Coincidentally with the disappearance of the edema the chlorida appear in the urine, showing a close association between the retention of chlorids and the retention of water in the tissues. Thus, in one case at the height of the relema the child was eliminating but .008 gram of softum chlorid daily; three days afterwards, while the dropsy was rapidly disappearing, the amount exceeded 5 gram. In the treatment of this condition the most satisfactory food in our experience has been protein mills. Whether this is due to its low sedium chlorid centent or not it is impossible to say. The administration by month of digitalis has seemed also advantageous. An infant of three or four months can take half a dram of the infusion three or four times daily.

The stools are sometimes normal, but usually contain undigested feed with mucus. No matter how carefully fed, these patients are easily upset-Vomiting is readily excited. The appetite in many is almost entirely lost; others take their food quite well and have fairly good stools but steadily lose weight.

Frequent complications are thrush and bedsores which are sometimes us a over the sacrum or levels, but most frequently upon the scriput-Occasionally there is seen a reflex spasm of the musicles of the nerk, perducing a marked oposthotomis, which may last for several days or weeksIn hospital wards these infants are very anoceptible to all infections, particularly to those of the respiratory tract. Otitis, rhinopharyngitis, bronchitis and paramenta are especially common.

The progress in most case is steadily downward; but it may be cut short at any time by scute disease. Frequently these infants die suddenly when apparently they are as well as they have been for several weeks. In summer they wilt with the first days of very but weather, and die often in a few hours from a slight functional decangement of the stomach and bowels.

The symptoms shown by some infants that have been fed for a long time upon a diet almost exclusively of carbohydrates merit special consideration. They suffer from what the Germans call Mehleukrschaden. The infants may have received proprietary foods or cereal decoctions in order to overcome diarrhea or because milk is impossible to obtain, and it is a restriction to carbohydrates for a long time that causes the characteristic symptoms to develop. For a while they may hold their weight or may even gain; before long, however, they begin to less weight and the less may be extreme. There is in some instances a marked lendency to edoma which may mask the loss. Pallor is striking.

Of especial importance, however, are a peculiar rigidity of the musculature and a great lessening of immunity to infection. The rigidity is especially marked in the legs. The muscles are contracted and hard. It is difficult to extend the extremities. In severe cases opisthotomus may develop. The diminution in the resistance to infection allows of the development of furuncles, otitis, branchitis and infections of the eyes. Especially characteristic is keratomalaria with perforation of the corner and destruction of one or both eyes.

The condition is a severe one and is frequently fatal. The longer it has existed the worse the prognosis. Infants with keratomalacia seldom recover. The severity of the condition is in large part due not only to the insufficiency of the food as a whole, but to the almost complete absence of fat, protein and salts. It is not unlikely that vitamines are also lacking.

With less of weight from any cause the other the child the better the chances of recovery. Very young infants are always difficult subjects to deal with. They go down more rapidly and books up more slowly than those who are older. Much depends upon whether everything possible can be done for the child; whether a wet-more can be occured and whether the patient can have the benefit of the best surroundings, in the country in summer and in winter a warm chimate where he can be kept out of doors the greater part of the time. In institutions cases in infants under four months old are usually hopeless. Of those over eight months quite a proportion can be saved by proper treatment, even though the body-weight

is reduced to eight of nine pounds. When recovery occurs it may be complete, and the child at two or three years may be as vigorous as any child of his age.

The most important treatment is that which relates to prophylaxis. Maternal nursing should be encouraged by every possible means especially among the poor. For these who must be artificially fed the important things are a pure milk apply together with proper instruction as to how 10 is to be used in infant feeding. At the same time opportunities for fresh air should be eccured. This is a large part of the difficulty in institutions.

As far as possible, wet-nurses should be obtained if the infants are under four months oid. For these very young patients success by artificial feeding is generally impossible. With those of an months or over, intelligent artificial feeding is very frequently successful. In institutions we seldom succeed without at least partial breast feeding.

For very young infants, with a temperature which is habitually subnormal, some means of maintaining the body host must be employed. The simplest and usually an effective means is to oil the body and envelop it completely in a cotton jarket and then surround it with hot-water hags or bottles. The room should be kept warm. In institutions it is convenient to have a warm room for such infants, the temperature of which is kept about 80° F. These infants equire no drugs but a great deal of careful nursing.

Malnutrition.—Failure to gain properly is ecosedingly common among young children, and such cases occupy a large part of the time and attention of one sugaged in polintric practice. The term malnutrition perhaps characterizes them better than any other. Although those children can not be said to be actually ill, they are very far from well, and their condition is often the cause of the greatest solicitude on the part of parents, not only from the existing state of health, but from the approhension of the development of some serious organic or constitutional discuss, especially inherenkesis.

Certain children are delicate from both, possessing only fields vitality, though without giving evidence of any artiful disease. They are often the offspring of parents of delicate constitution and poor physical development, or of those with tuber-ulosis, good, or syphilis. Very many city children are included in this group. Among the poor the condition is the result of bad hygione, maniferent or improper food, overcrowding, etc. Among the well-to-do it is oven in those who inherit a too highly developed nervous organization with a corresponding amount of physical deterioration. Another group includes those children who were premiture or very small at birth, weighing perhaps only three or four pounds. Many cases are traceable to improper feeding or equally your nerving during the first few months. These children get a poor start in life, and on that account are handleapped throughout infancy. A frequent cause of malinutrition in infants is the permisses custom of keeping them in close apartments where the thermometer ranges from 72° to 75° F., and where the greatest anxiety is constantly felt lest they take cold. Such infants may lose in weight, become animie, and exhibit all the signs of malinutrition when nothing else is wrong except the conditions mentioned. Malinutrition often depends upon some previous neuto disease, especially of the stomach and intestines.

In children who are over two years old the condition of malnutrition may be due to any of the factors above mentioned—anterited feebleness of constitution, but feeding and its resulting indigestion, too little fresh air, and close confinement indoors. It is, however, at this period, much anore frequently than in inflancy, dependent upon some previous acute disease. As a result, an impression is left upon the child's constitution which lasts for months, often for years, and which manifests itself not by any special local symptoms, but by a general condition of debility. Faulty methods in calculation, especially overpressure in schools may have a deleterous effect upon the health of older children.

Not only the weight but the general physical development is much below the normal. At one year the body length may be those or four inches less than the average. Dentition may not be materially delayed. Muscular development is backward; many of these children do not sit alone until a year old, and barely walk at two and a half or three years. The muscles are soft and flabby, and the ligaments so weak that paralysis is often suspected. The body is so small that the head seems unnaturally large, and a diagnosis of incipient hydrosephalus is frequently made. Mentally these infants are somewhat backward but the mental development is often strikingly in advance of the physical. Some symptoms of rickets are usually present,

The examination of the blood reveals the usual changes of a moderate secondary anemia. The circulation is poor, the hands and feet are frequently cold. In many children the skin is unnaturally dry; in others there is a disposition to excessive perspiration, particularly about the head. Nervous symptoms are frequently present. These children are restless, fretful, and irritable; they sleep budly. Enlargement of the lymph glands, especially those of the neck, is common.

One of the most characteristic things about these patients is their feeble power of digestion and assimilation. Unremitting care and constant watchfulness are required to keep them up to even a moderate standard of health. The most trivial changes in food may upset them. Attacks of arute indigestion are usually brought on by overfeeding—the mistake which is almost invariably made by mothers who are discouraged.

with the slow progress made, and are anxious to make their children grow fat and strong. The balance is so deficately adjusted that the slightest deviation from proper rules of feeding, either as to the quality of the food or the quantity given, is immediately followed by an attack of arms undigestion, often by severe diarrhen. As a result, the child may lose as much in two or three days as he has gained in a month or more. These arms attacks, if in summer, not infrequently prove fatal. Not only do these patients have but little resistance to acute disturbances of the stomach and intestines, but any acute disease is evisus—meades, whooping-cough, and presuments being especially fatal.

If under six months of age, among the poor or in institutions, such infants are almost certain to go on from had to worse. In private practice, where it is possible to have the last care and surroundings, with the conperation of an intelligent mother or nurse, a very large number of these infants can be reared. After the second year has passed the problem becomes a much simpler one, and if infertious diseases and other forms of neute illness can be avoided, the probabilities are in favor of the child's becoming stronger each year and growing to

maturity.

Older children are thin, pale, and undersized, particularly if the condition is constitutional or hereditary. Sensetings they are taller than the average for their age, and their symptoms are often attributed to too rapid growth. One of the most striking things about children suffering from malnutrition is their vulnerability. They "take" everything. Catarrhal processes in the nose, pluryna, and breachi are readily excited, and, once began, tend to run a protracted course. There is but little resistance to any acute infectious disease which the child may contract. Often one illness quickly follows another, so that those children are not infrequently sick for almost an entire season. Their muscular development is poor; they tire readily; are able to take but little exercise, and their circulation is sluggish. Mentally they are usually bright, often precocous. They are cross, fretful, and any musual excitement produces an effect which lists for some time. Their sleep is usually disturbed and restless; they waken frequently, and ascassonally suffer from night-terrors.

Digestive symptoms, if not constant, are very easily excited. Children of five or six years have to be fed as carefully as infants. The appetite is usually poor, and mothers are distressed because their children eat so little, yet, when fixed is arged upon them, attacks of indigestion follow with singular regularity. The longue is slightly coated the greater part of the time. The bowels are apt to be constipated, apparently more from lack of unuscular tone than from anything else. From time to time there may be large quantities of muons in the stocks for two or three days. A

moderate amount of anemia is always present, and this may be the most striking feature.

The duration of the condition depends very much upon the cause. If the cause is constitutional or inherited, it is likely to last throughout childhood, but it often greatly improves about the time of puberty. When it follows some acute illness it commonly lasts for a few months only. The langer the condition has lasted and the greater the general disturbance the slower will be the improvement. The great danger is the supervention of some acute disease.

It is oftentines difficult to find out to what the failure properly to develop is due. Much regarding inherited constitutional tendencies can be learned from the family history and from the condition of other children in the family. Tuberculosis must be carefully excluded.

Other things to be considered are syphilis, rickets, diseases of the blood, intestinal parasites and, of course, organic diseases of the lungs, heart, stomach, intestines, liver and kidneys. Even malignant disease, though rare, should not be overlooked. It may take careful observation for several days, and semetimes for several with repeated physical examinations, before all these conditions can be positively excluded.

In private practice a large proportion of rases are due to improper feeding or nursing; next in importance are improper surroundings, and last come inherited constitutional soudificus. In other words, most of these children are born healthy, but become ill or delicate in consequence of improper management.

In offer children, after excluding constitutional and local diseases, the whole life of the child must be investigated to discover the fundamental condition which is at fault. A surefully obtained buttory from infancy is of the greatest assistance. It is often difficult, and sometimes impossible, to get at the primary factor, for in cases of long standing there may be symptoms connected with almost every function of the body. One should scrutinize closely the quality and quantity of food given, the amount of sleep, the bears of study and recreation, the amount of exercise in the open air, and the physical conditions surrounding the child. Usually the most important factor in the case can be discovered.

The problem of nutrition is to be solved by diet and general management; drugs occupy a very small place in treatment. With infants whenever possible broast feeding should be employed. Next in importance to diet is fresh air. The natural tendency of a mother who has a delicate infant is to house him closely and never allow him a breath of fresh air. It is of the greatest assistance if these children can be sent to a warm climate for the winter. If this is not possible, fresh air may be obtained by changing apartments, or by an airing in the room with the windows stem.

Cold sponging is a valuable tank that can only be employed, however, with fairly vigorous infants that next promptly. If the child remains blue and cold for some time afterward, the cold sponging shauld not be repeated.

Friction and missage are useful in many cases. The shild should be laid upon the lap of the nurse, if possible, before an open fire, and should always be covered with a blanket. The entire body should then be rubbed for ten or twenty minutes with the bare hand, or, better, with escond batter. Professional operators are inclined to be too energetic for little children.

The only tonics of much value are iron, preparations of saalt, now vonice, and cod-liver oil. Cod-liver oil is too much used in these cases, and in too large doors. Many of these maints can not take it at all. It should not be given when the bangue is control and the appetite poor. The door should always be small, e. g., ten to twenty drops of the pure oil three times a day, or twice as much of an emulsion.

Experiments in treatment are nearly always unfortunate. The physician should indicate in writing, for the guidance of the mother, specific rules with regard to the amount of fool, the time at which it is to be given, the hours for bathing, sleep and airing. He should see the patient at regular intervals and often exough to be sure that his orders are being inforced. Good results are obtained only by constant watchfulness.

The same general principles are to be applied to older children as to infants. The diet is of the first importance: Only the simplest and most easily dipoted articles of food should be given. Milk, beef, eggs, the lighter and more easily digested sereals and regetables, bread, and fruit should form the diet. All sweets, pastry, highly somened food, can'r, nuts, tea, and coffee should be absolutely probibited, and, in fact, all the articles mentioned as "fortedden" in the Chapter on the Feeding of Other Children. When the appetite is poor and simple food not well taken, the child should not be allowed to take indipostalls articles for the sake of eating something. Nothing should be given between meals, and regular hours of feeling must be followed. Three meals a day, for children over three years old, are better than the practice of giving more frequent feelings. Under no ciryumstances should children be coated, urged, or hirel to ent; much less should they be forced to do so. There is a popular misapprehension in regard to the variety in diet which children need. Most children do better when a very simple and fairly uniform diet is continned.

The nervous factor is a very large and a very important one. Many of these children are essentially cases of neurosthenia at as early an age as four or five years. Excitement and activity are what they crave and what must be most carefully avoided. The general habits of children should be directed; there should be regular and early hours for retiring, freedom from under excitement, and interest should be awakened in outdoor amusements. Unblive should be kept as much as possible in the open air, but the amount of active exercise should be strictly limited. Usually they do much better if they can be in the country during the entire year. Only a limited amount of reading and study should be allowed; and if children are at which, care should be taken that overpressure is not the cause of the symptoms, particularly in an amistious child. Cold sponging given in the norming, as described in the introductory Chapter on General Thompsutics, is extremely beneficial to children who take cold readily. In general, these children require early hours, a simple dict, a quost, regular life, and very little medicine.

In recent years there has been a disposition to attribute many of the symptoms included in the foregoing pages to manifectancy in the secretion of the ductiess glands. Extracts from these glands have been widely employed in treatment. There is no satisfactory evidence that such an etiology is correct or such a treatment beneficial.

CHAPTER VI

DISEASES DUE TO PAULTY NUTRITION

The diseases size to faulty natrition are numerous. There are two, bowever, which have been so clearly shown to originate in this way that they may be put in a class by themselves. These are scorbutus and rickets. The purpose of considering them in connection with the disturbances of nutrition is to emphasize this relationship.

SCORBUTUS (Scenip)

Scorbutus is a constitutional disease due to some prolonged error in diet. It is characterized by spongy, bleeding gums, swellings and ecohymoses about the joints, especially the base and ankle, henorrhages from the new, and occasionally from other miscous membranes, extreme hyperesthesia, and often pseudo-paralysis of the lower extremities. Added to these local symptoms there is in advanced cases a general cochexia with marked anemia. While accritatus and rickets are very frequently assocated, they can not be considered as deferent forms of the same disease. Cases of acarbums were, honover, described in older writings under the table of Acate Birkets.

Scurry was soft recognized and graphically described by Glisson as long ago as the middle of the acceptanth century. For our earliest modern knowledge of the pulledogy of the disease we are indebted to the observations of Barley and Cheaffe. On the continent of Europe scurry is most frequently known as Barley's disease.

Scarry is not a rare disease. In active hospital and private practice many races are seen cach year.

Etielogy.—Age is an important factor; more than four-fifths of the cases occur between the sixth and the fifteenth months, and half of them between the seconds and the teath months. Source has been seen as infants under a month old. The majority of the cases reported have been electred in private practice, often in the best surroundings. Previous discuss is not a factor of much importance. Most of the children attacked have been in good health up to the development of seurey. In about one-fourth of the number some previous decangement of the digistive tract has existed.

The only stinlegical factor for known to bear any constant relation to the production of scarry is diet. The important facts regarding the previous diet have been well bought out by an investigation of the American Pediatric Society. They were as follows:

This table shows that while scurvy may semisimally develop with almost any variety of food, three stand out prominently—via, proprietary infant foods, condensed milk, and sterilized milk. In all of these it would appear that something needed for normal healthy antition is wanting. Scurvy is not likely to follow unless an improper diet is continued for a long period, usually several months. In some instances when it developed in nursing infants, the norse's milk has been examined and found totally inadequate to the needs of nutrition, many of the children having exhibited serious disturbances of nutrition before any signs of scurve appears.).

Several cases have come under our observation where sensy has developed in children who have been kept for four or five months upon raw mills very greatly diluted. Scorry may result from taking unik which has been partenized, usually when the temperature has been high (167° F.), and the time prolonged (30 massies). With the lower temperature now more generally couployed (153° F.), it is less likely to desclop. We do not believe scarry to be a frequent result of the justicarization of milk, and not to be weighed against the advantages of pasteurization; but still a danger to be reckened with. Since the general me of pasteurized milk the number of cases of courcy is certainly on the increase. The number of cases which develop while on a diet of boiled or sterilized milk is so large that we are driven to the conclusion that the heating alone is the cause, especially since prompt recovery has often followed when no other charge is made than to discentione the heating. These facts show that the sterilization of milk is attended with some disadvantages, and should not be continued as the solo diet for long periods.

The addition of carbohydrates to the feed afferds no protection, but rather increases the danger of sourcy.

Scursy frequently develops after the prolonged use of condensed milk or proprietary foods as the side dict.

There is certainly a predisposition to this discuss on the part of some infants, for with the same dist one child may develop the discuss while another remains free. We have seen twins fed in sancily the same way, one of whom developed senery while the other did not.

While it may be regarded as established that the cause of senery is distetic, no single dietetic error can be held responsible for the disease. It
has been recently shown that there are substances in foods titally necessary for health, the situmins. It is quite clear that nearry depends
upon the absence of some of these. Either they are lacking in the food
or have been destroyed by prolonged heating. Typical scurvy can be
produced in some animals by giving a diet chiedly of grain with no
fresh regetables or fruit. The addition of these latter articles immediately curves the disease. So it is with children who are at once relieved
by orange or lemon jucce, or as Freise has shown, by the dried alcoholic
extracts of regetables.

Lexicus.—The most marked affects of scurry are sum in the bones, blood-twoods, and the blood. The number of recorded autopoies in this disease is not large. We have had the opportunity of making examinations in seven cases. The findings are remarkably uniform, but represent, of course, the extreme results of the disease. The most striking lesion is subperiesteal hemorrhage, which is practically constant and may occur almost anywhere in the body, but affects chiefly the bones of the lower extremities; it is often very extensive, and may reach from the knew to the great treelunder, or from the ankle nearly to the knew Extravasations may also be found between the muscles, and blood may infiltrate the cellular tions in the neighborhood of the joints. Besides

these lesions resulting from homorrhagic periosities the bone itself may be affected. Separation of the epiphysis from the shaft of some of the long bones, generally at the shoulder, lower and of the femur or lower and of the tible, is femul in most of the fatal cases. Notwithstanding the serious lesions near the large joints, the joints themselves are usually normal.

The microscopical changes in the bones due to scurry are quite characteristic. They consist in bemorrhages within the marrow as well as beneath the periodeum. There is a diminishin of osteoblastic activity; the esteoblasts are relatively few in number and the formation of new bone is decreased or has altogether reased. What home has been formed, however, is well calcified. The absorption of bone is not increased. For this reason the shaft of the bone is firm but there is a place of least resistance in the solections are ewing to the lack of bone formation. It is through this weakened zone that superation revurs as the result of very slight traumation.

The marrow undergoes extensive changes. The marrow cells in areas, especially in the neighborhood of the epiphyses, have largely disappeared, leaving only the supporting cells. In addition there are almost always found some of the changes characteristic of rickets.

The visceral besisns are inconstant. These most frequently found are small homorrhages beneath the pleura, pericardiam, and peritopeam sometimes into the various organs, also besnehopneumonia and peptiritis, which occasionally occur as complications.

There may be small extravolutions found upon the surface of any of the mucous membranes. Alterations in the blood-vessels are undoubtedly an important factor iii bringing about the disposition to hemorrhage. The changes in the Blood, in the gums, and the lesions of the skin will be considered with the symptoms.

Symptoms.—In many cases a period of indisposition, fretfulness, pallor, and failing notition precedes the local symptoms, but usually tenderness of the legs is the first symptom noticed. In the beginning this is occasional and so slight as to cause the infant to cry only upon being handled. Later it becomes almost constant and is very scale. At first this screness is not very definitely localized, but is generally more marked about the knees and ankles. Some smelling may be noticed, often just above the ankle joints. Coincident with these may be seen the changes in the mouth. The gams are of a deep purplish color, excellent particularly about the upper control meiors, and may quite cover the teeth. They bleed from the slightest irritation, and sometimes spontaneously. The child now becomes fredful and cross, sleeps bully, lower color, weight, and appetite. He may become quite cathedric in appearance. All these symptoms come on very gradually, often with periods of

a few days in which apparent improvement is seen. Sometimes they may continue for several weeks without making any perceptible impression upon the child's previously good condition.

If the disease is recognized, and proper treatment instituted, rapid improvement follows, with complete and permanent recovery. If not recognized, and the faulty diet is continued, the disease advances to the more severe form. The tenderness of the legs becomes coquisite, so that any movement or even the eligitest touch causes the child to scream with pain or apprehension. The posture is very characteristic. There is semiflexion of thighs and legs and outward notation at the hip. (See Fig.



Fig. 19.—Scoure Superior Caracteristics Sweateness And Posterio. Patient S.J. aceths etd. fed exclusively upon insited suit after the age of 2 months. Epiphysical argumition at the upper extremity of both humori, however, extremity of both feature and forms extremity of left tibia. Prompt and complete recovery.

19.) In this position the child often lies motionless and voluntary movements of the extremities can not be excited. Parallesis is often enspected, The disability is chiedy owing to the extreme pain which motion protakes, but may depend upon epophyseal separation. Small exchanges are frequently seen about any of the large joints, resembling the ordinary "black-and-blue" spots, and these often confirm the spinion previously formed that the child has met with some accident. The swelling near the joints, particularly the knee, may be so great that the limb is nearly twice the size of its fellow. The buscul symptoms are usually striking. In addition to spongy, seedlen, bleeding gums, dark purplish bugs may be seen over teeth not yet through. There may be bleeding from the roof of the mouth or from the pharyax. The pain is sometimes so severe as seriously to interfere with taking food; there is moderate though rapely extreme saliration. Blood may be vomited or passed with the feces or the urine. In the severe cases the steeds are rarely normal, more or less catarrhal colitis usually being present. The general condition is one of grave anemia, accompanied by a marked carberia and progressive wasting. The child cries almost constantly, sleeps little, and is truly a pittable object. Slight fever is usually present; and in some of the mere rapidly progressing cases with extensive lessons a temperature of 103° or 103° F, in commun. Unless recognized and the cases removed, the condition grows studiely worse, the symptoms continuing until death occurs enter by slaw authenia, or suddenly from heart failure, or from some intercurrent disease, each is broughoptesments or acute gastro-exteritia. The duration of the illness in the fatal cases is from two to four months.

The onset is gradual in the great majority of the cases, the earliest symptoms noticed in the order of frequency being pain and tenderness of the legs, soreness and spongrosss of the gents, disability, anemia,

enlancous himorrhages, and very rarely bemularia.

Pain and tenderness are very prominent, being noted in about 95 per cent of the cases; in the majority they are present only on motion or handling. The location of the pain and tenderness in 184 cases was as follows: Lower extremation alone, 133; upper extremation alone, 2; lower and upper, 42; lower and trunk, 7. In all but two cases, therefore, the lower extremation were afformed, the lower part of the thigh and the log just above the ankle being the usual west.

Disability, or poemio-paralysis, is a very common symptom, and in all severe cases a constant one. It exists in varying degrees from a slight disinclination to use the limb to complete helplestness. In many cases it is more marked than the pain, and has led to a diagnosis of police

myslitis.

Swellings are associated with pain and tembersess in most of the severe-cases. They are most marked near the joints, but may extend for some distance along the shafts of the bones. In nearly all cases the location is the lower part of the thigh or the lower part of the leg, and usually of both sides. Swellings are occasionally som at the shoulders or wrists; in rare cases there may be swelling about the elbows or hips or over the ribs, scapula, or dism. Bedness is not generally present, but the parts may have a dark purphish color. It is to the homorrhages that both the swellings and the discolaration are chiefly due. There is after marked edems of the affected limbs.

Protrusion of the cyclaff is present in a small proportion of the cases; an extreme exceptitualmus is sometimes seen, and is due to orbital hemoteluge.

The gious are affected in nearly all cases, the exceptions being those recognized and treated early. Hemorrhage occurs in about one-half the cases, and frequently there is observation not unlike that of a mercurial stomatitis. It is rather curious that, though the lower teeth are cut first, the upper gum is almost always most affected, and in the milder cases are ally alone involved. Of 43 cases in which no teeth had been cut, the gums were affected in 24 and normal in 24. This is sufficient to disprove

the old opinion that the gams are affected only when teeth have appeared. The severe inflammation and ulceration sometimes seen seem to be the result of secondary infection.

Hemorrhages beneath the skin are present in about half the cases. They are rarely extensive, usually multiple, and their location is no doubt often determined by a slight traumatism. Hemorrhages from the mureus membranes are not quite so frequent. There may be bleeding from the gums, nose, lowels, and rarely from the stomach. Hemorrhages in most cases are frequently repeated, but seldem profuse.

Epiphyseal separation is seen in most of the very severe cases. It is most frequently either of the lower epiphysis of the femur or the thin, or the upper epiphysis of the humerus, and is often bilateral. The actual separation may be caused by some slight injury, the condition of the bone predisposing to this occurrence. In several cases of our two with separation which recovered, rapid union occurred under anti-scorbatic treatment.

Early in the disease, even though marked swelling of the limbs may be present, an X-ray examination may show little or nothing. The subperiosteal hemorrhages can not usually be made out until there is a deposition in the effusion of the salts of calcium. Then they appear with great clearness as spindle-shaped thickenings of the bones, sometimes running the whole length of the disphyses. These are absorbed very slowly and require weeks or months to disappear. Changes at the spiphyses are also found. They consist in distortions and irregularities of the normal line. Separation of the epiphysis can be occasionally made out. Some raphitic changes also can usually be recognized.

Anemia is elight in the early stage, but increases as the disease progresses. Blood examinations may show marked reduction of the hemoglobin, sometimes to thirty-five or forty per cent; also in nearly all cases a proportionate reduction of the red cells. The changes are those of an ordinary accordary anemia.

The urine contains albumin in about one-fourth of the cases; in nearly half of these containing albumin casts also are found. In rare cases bematuria is an early symptom. Blood cells neally in moderate numbers are found in practically all but the mildest cases, and are of some diagnostic importance.

Evidences of general malnutration are present in all advanced cases, rarying, of course, greatly in degree. In a few infants under our own observation the weight, color, and general appearance of health have continued in spits of very decided local symptoms. In most of them the impaired nutration is shown by loss of appetite, occasional attacks of veniting, and still more frequently by detangements of the bowds, which vary from slight indigestion to a serious external condition of

both small and large intestine. It is with the latter that the discharge of blood is usually seen.

Association with Richets,—In the American Pediatric Society's investigation great pains were taken to obtain definite and accurate data regarding this. Of the cases, 310 in number, in which this point was noted, symptoms of rickets were present in 152, or 45 per cent. Mild grades of rickets are, of course, impossible for us to recognize. Post morters, rickets is almost invariably found associated with sensity, for the reason that during the age at which source may develop rickets is, in hospital judients, a well nigh innversal disease. There is no reason for believing rickets and coursy to be different forms of the same disease. The two most striking characteristics of sourcy, riz., tendency to hemorrhapes and prompt cumbinity by fresh food and fruit jusces, have no counterpart in rickets.

Diagnosis.- The discuse with which infantile senry is most frequently confounded is rheumatism. In fully four-fifths of the cases. which have come to our notice this has been the previous diagnosis. The extreme rarity of rheumatism under one year should always make one cantians; pain and tenderness of the logs only, should, in an infant, invariably suggest scarry rather than rheamatism. The extreme disability has often led to a diagnoses of poliomyelitis, but here again the acute tenderness should set one right. Many cases of scurvy come into the hands of the orthopedic surgion with a diagnosis of joint or spinal disease. Where the swelling was mainly of one limb to have twice known a diagnosis of malignant flirears to be made, from the nuclexia, the shape of the swelling, the discoloration, and the pain. We have known two cases to be operated upon by eminent surgeons, once with a diagnosis of sarcorm and once of estitis of both tibiac. Not until the subperiostest hemorrhages and optiphyseal separation were discovered was the nature of the trouble suspected.

The diagnosis of scurry schlors presents any difficulties to one who has once seen a case. No one used err if the essential features of the disease are kept in mind; the extreme coreness of the legs, spongr, swellen gums, swelling mear the large joints, a tendency to hemorrhages, and usually a history of the prolonged use of some proprietary infant food, or starilized or condensed milk. The apophysitis of hereditary applitudes has many symptoms in common with scurry, but it usually occurs at an earlier age (before the fifth month) and other evidences of syphilis are usually present. If any doubt exists, this will be removed by the prompt improvement and generally rapid cure following an anti-scorbutic diet.

Prognosis.—This is invariably good if the discuse is recognized early.

No pulsents with symptoms so serious improve with such marvelous

rapidity as do the great majority of those with scurvy, under proper management. The figures of the American Pedintric Society's report on this point are interesting. The average duration of the disease before treatment was begun in over three hundred cases was somewhat over three weeks. In eighty per cent striking improvement was noticed during the first week of treatment, and in forty per cent within three days. Over two-thirds of these cases were well within three weeks, and nearly one-third within one week, after the beginning of treatment.

It is only when the disease is of long standing, when the malnutrition is severe, or when serious complications, usually involving the digestive tract, are present that the symptoms persist and the issue becomes doubtful. It is difficult to tell what the exact mortality of scurvy is. Any case allowed to go on may result fatally. The younger the infant the more likely is this to occur. We have seen five fatal cases. In one of our patients death resulted from hemorrhage which followed an incision into an epiphyscal swelling at the lower end of the femus, made before the patient was seen and which persisted despite all treatment. Barlow's early article included thirty-one cases with seven deaths. It is rare that scurvy leaves any permanent effects. Recovery is not only rapid but complete. Relapses are extremely turn and have been observed only in one or two cases, where chronic indigestion existed of so extreme a character that proper beeding was impossible. The after-effects are usually the result of prolonged malnutration, of which the attack of scurry was only one manifestation.

Treatment. Prevention requires that all infants reared on sterilized or padeurized milk should be given other food much earlier than was formerly thought necessary. It is not enough to add grael or farmacesus foods. Fruit juices should be begun as early as the fifth or sixth month. Beginning with two teaspoonfuls the amount may gradually be increased to two or three tablespoonfuls daily and continued as a regular part of the diet. The early use of broth in which green regulables have been cooked is also of value, or the grated segetable may be given to the infant as a purce. The treatment of sourcy is usually very simple-viz., to discontinue all proprietary foods, condensed milk or sterilized milk, and to solutitute a diet of fresh cow's milk, modified to suit the child's digestion. With this change alone improvement will soon begin and gradual recovery take place. However, when fresh fruit junc is added improvement is much more rapid. It should always be combined with the change in elet. Orange juice is to be preferred, but the juice of any fresh ripe fruit will answer the purpose. Oranges should be sweet and frush. From two to four onness of the juice a day are required, lest given in divided doses, about one hour before the milk-feeding. It may be given plain or diluted with water. In some cases when not well tolerated by the

stormed, it is better given at night when no feed is taken. Potato also has marked anti-scerbatic properties, and may be given in the form of a purio to infants as young as eight or ten menths. The only really difficult cases to manage are those in which the general condition approaches one of markedman, or when tenrey is accompanied by marked gastric or intestinal disturbance. When an intestinal enterth is present, with the bowels moving five or six times a day, one may bestate to give the fruit juice for fear of increasing these symptoms. In a number of instances we have seen intestinal symptoms, which had resisted ordinary measures, immediately improved by the fruit juice, thus establishing their intimate connection with the southetic condition.

Other things of value are fresh keel juice, and for older children all fresh vegetables, especially potato. The anomia and malautrition call for iron; cod-liver oil, and other tenies, which should be given after active symptoms of the disease have disappeared. Infants with scurvy should be handled as little as possible, and should be particularly protected against exposure in their extremely susceptible condition. To relieve pain and prevent deformity the affected limbs should be immobilized by splints during the period of marked symptoms if apophyseal separation has taken place, and in many other secret cases.

RICKETS (Reckgo)

Rickets is a chronic disease of nutrition. While the only important anatomical changes are found in the hones, it is not to be regarded as a disease of hone, but as a very complex pathological process, the result of disturbed metabolism, which affects chiefly the hones, but also the muscles, ligaments, mucous resultances, and nearly all the organs of the body, including the nervous system. It occurs especially between the ages of six and eighteen months. While not a fatal disease per se, rickets adds very greatly to the danger from all scate diseases in infancy, and even to some degree also to those of later life.

The great frequency of rickets has only recently been recognized. It is probably, at least in cities, the disease from which infants most frequently suffer. It has been possible to determine this only since the pathology has been firmly established, for many cases give no clinical evidence and the disease can be recognized only post mortem. The symptoms by which we recognize to kets are chiefly due to bone changes, and these must be quite well marked below they are discovered clinically. For this reason rickets may run its course without any suspicion having been aroused as to its presence. Schmorl found in 886 consecutive autopoios upon children dying between the second month and the fourth

year, evidence of rickets in 90 per cent, while 96.6 per cent of infants between the fourth and eighth month were rachitic. There can be no doubt that among the poer in cities, rickets is an almost universal disease.

Etiology.—Certain facts in the causation of rickets are well known. It is closely related to improper feeding and bad hygienic surroundings. Artificially-fed children are much more prone to the disease, especially those who are badly fed. Breast feeding does not entirely protect against the disease, though it greatly medifies its character. Severe forms of rickets are not common in aursing children unless factation is unduly prolonged, as, for example, when nursing is continued for fifteen to eighteen months without other food. There is a predisposition on the part of certain children to acquire rickets quite independent of the food. Of two children that are nursing the same monan, one may develop rickets perhaps in a severe form and the other may escape it; and allowing a rachitic infant who has been breast fed to nurse a woman whose own child is not rachitic, brings to assurance that the rickets will be cured.

The dect of children who develop rickets upon artificial feeding is most frequently deficient in fat and often at the same time in protein, while it is apt to contain an excess of earbohydrates. It has been believed that the most important factor is the deficiency of fat. Rickets a exceedingly common in children reared upon the properitary foods, nearly all of which are very low in fat and contain an excess of carbohydrates. It is also common in children who are reared upon sweetened condensed milk.

According to Feer, infants in the mountainous parts of Switzerland soldom develop rickets although they may have been breast-fed for only a short time and thereafter are given a doct almost exclusively of carbohydrates. It is doubtful if diet has the importance that has been ascribed to it in the past.

Though animals under demonstration suffer from rickets, it is impossible to produce the disease by even the most almormal diet. Certain experiments have been made which show that a condition of the bones resembling rickets may be produced in animals by a diet deficient in calcium salts, and furthermore that this may be cured simply by the addition of these salts to the food. The conclusion can not, however, be drawn that rickets in children is produced in this manner. In the first place the bony condition in the artificial disease is not histologically the same as that seen in rickets; again, rickets in the child is not cured simply by the administration of calcium salts; and, finally, rickets develops when these elements have not been deficient in the food.

Rickets is essentially a discuse of cities, being most often seen in children living in crowded tenements where, in addition to improper food, the hygienic surroundings are the poorest. For this reason poer ventilation, filth and lack of similight have been regarded as potent factors in producing the disease. Their exact influence is difficult to determine.

Distribution of Rickets.-It was formerly held that rickets was almost unknown in many parts of the world. It is now apparent that practically no region escapes. The greatest frequency of the disease, however, is in the temperate zone. Tropical and semi-tropical countries are relatirely free from rickets. But the inhabitants of these countries, partieplarly the negro and the Italian, when removed to cities of the temperate cone, suffer most frequently and severely. In the rities of America norace is exempt from the disease. In New York the greatest succeptibility is among the negroes and Italians. The extreme cases of rickets seen are almost invariably in one of these nationalities. It is exceptional to see in a dispensary or bospital a child of either of these races who does not show, to a greater or loss degree, the signs of riccets. These two southern moss seem to bear very bully the climate and the confined life of the porthern cities. So far as our elservations are concerned, there is no peculiarity in the food of these people which explains the prevalence of rickets among them, and it must be attributed to a race peculiarity. In the country, the immunity from rickets may be partly fine to the more jorvalent custom of maternal mursing, and partly to the better surroundings, the increased resistance of the children rendering them much less susceptible to unwholesome influences than children in the cities. Among dispensary and hospital patients of our large cities rickets is exceedingly common, and is seen shiefly in the foreign elements of the population.

Season.—This apparently has an important influence upon the development of the disease. The figures from four large outputient clinics show that from January to June there were treated more than twice as many rachitic patients as from July to December. Schmorl has reported that he found early cases at autopsy rather more commonly in the cold months them in the warm, that the most active cases were considerably more frequent in the cold months, and that the vast majority of cases with evidences of healing were seen in the summer and early fall. The active symptoms of rickets are more frequently seen and are more setter in the winter and spring. What it is that determines this we are as yet quite anable to say.

Heredity.—The influence of heredity is difficult to determine. It is believed by some excellent authorities to be a factor in the production of the disease. Singert has reported numerous instances where children with rachitic parents developed rickets while other children of nonrachitic parents diving in the same environment and receiving the same

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food did not develop rickets. Elgood has given the history of a woman who was married three times. By her first and third husbands, who had not had rickets, she here children who remained free from the disease, while by her second husband, who had suffered from rickets, she here five children, all of whom developed rickets. There seems to be no greater reason for denying the influence of heredity in rickets than there is in arterioscleross or tuberculosis.

Previous Disease,—Richets not infrequently develops in syphilitic children; the connection, however, seems to be no closer than with any other cachesia. Chronic disorders of the digostive tract nunctimes preceds and often follow the development of rickets. It appears to develop quite independently of previous disease.

Rickets affects noth sexes with equal frequency. The symptoms usually manifest themselves between the sixth and eighteenth months.

Congenital and late rickets will be considered separately.

Experimental Richets.—Rickets is never found in wild animals; in those under domestication, especially with in-breeding, it is by no means surroual. In sollogical gardens it is quite prevalent. It would appear easy, therefore, to produce rickets, but the attempts have been almost always unsuccessful. By depriving animals of calcium and phosphorus severe lesions of the bones have been produced, enlarged epiphyses, bending of the hones and even fractures, but the condition is an esteoporosis and not rickets.

By bacterial inoculation Morpurgo produced true rickets in white rats. Findley restricted the activity of pupples and saw pickets develop. Klose and Matti claim that true rickets results in dogs from early thymns extirpation. It is undoubtedly true that rickets did follow some of their operations, but that it was due to the removal of the thymns seems open to question.

Pathology.—Rickets is a disorder of nutrition, the result of some disturbance of metabolism in which calcium plays a very important rôle. The exact nature of this disturbance is not yet understood. Three theories have been advanced in explanation of the deficiency of calcium in the bones, which is the most striking characteristic of the disease. The first one, that rickets is due to a lack of calcium in the food, is not supported either by clinical or experimental stridence. The second theory is that the disease is due to an increased excretion of calcium as a result of disturbances of digestion. It is very likely that the increased excretion of calcium occurs only in rachitic children. Diet alone or disturbed chemical processes are not sufficient calcium is furnished in the food, it is excreted in excess because the bones are incupable of absorbing it. This is the theory that has the most clinical and experimental existing in the theory that has the most clinical and experimental existing in the food, it is excreted in excess because the longs are incupable of absorbing it.

dense in its favor; though what produces the incapacity of the bone to retain-calcium is quite unknown.

Lesions.—The only constant and characteristic lessons of rickets are found in the boxes; these changes are sufficiently definite to give it a place as an essential disease. One of the most striking features of rachitic boxes is their numetural featibility. This is due to the lack of mineral salts in the boxes and repetially to the lack of calcium. Normally boxe contains about one-third organic and two-thirds inorganic matter. In marked rickets the proportions are reversed, the boxes often containing twice as much organic as inorganic matter. While all the inorganic elements are actually diminished the phosphorus and magnesium may be relatively increased. The chief has in the calcium.

The changes in the shufts and flat bures are universal. Those at the epiphyses show a marked parallelism with the activity of growth. Where growth is most rapid the lesions are most astranced. The middle ribs are carliest and chiefly affected, then the other ribe and the lower femoral epiphyses, the lower extremities of the radius and tibia, and sventually in some cases all the long bones, including the metacarpal and the phalanges. There are characteristic changes in form. The most constant is enlargement at the epiphyses, which is most strikingly seen at the lower extremities of the radius and tibes and at the costo-boudral junction of the moldle ribe. All the sharp angles, beeders and pounluences of the boxes are officed. The curvatures of rachitic boxes are allowed by the increased flexibility due to the loss of mineral salts. They may be due to a variety of causes. Some are simply an exaggeration of the normal curves much increased by the swelling of the epiphysis; others are due to massular setion, to atmospheric pressure, to some annatural porture, such as the cross-legged position, to the weight of the limbs or the weight of the body. Marked deformity is usually due to displacement of the eniphysis or to fracture. Displacement of the epiphyses is rare except in the ribs, where it occurs to a certain extent in every aftenced case. Fractures of the long house are very common. The bones most frequently broken are the radius and ulna; next in order the ribs, humerus, femur, fibula and clavicle. The fractures are usually of the green-stick variety with more or less impaction and are generally followed by the production of considerable callus, though subperioscal solution of continuity is occasionally found with no deformity and bittle if any callus. When bending occurs there is a production of new tissite beneath the periodeum to compensate for the mechanical disadvantage of position in which the new bane is placed. The shafts are frequently greatly thickened. The principal change in the form of the flat bones consists in the production of large bosses or prominences upon the parietal and frontal bones, due to an increme of vascular, immatere



physical like is quite regular and shirply separates best from carding hive been automated by lone and convited into trabestine. The plantal libe, (d) columns of releited interestballs cartillage which NAMES CONTOCOCOURGE PERCENCE, IN SANISARY,

COSTOCRANDALL JUNETION IN LIEUR RICERTS.

cartlage, (6) cartilage protocted by calcifornion.



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being beneath the pariesteum. Bosses are found where the normal bending produces the greatest stress upon the hone. The deficiency in calcum over areas in the occupital bene that are thin even under normal conditions, allows them to indent under the finger. This is craniotales.

In a longitudinal section of one of the long bones the principal change seen at the extremity is that the cartiloginous layer which unites the epiphysis and the shaft is very much enlarged both in width and thickness, the latter being sometimes four or five times the normal. The transitional zone is a whitish or bluish-white color, rather softer than normal cartilage. On one side it blends with the cartilage of the epiphysis, on the other it presents an irregular dentated border. The normal red marror may cease a quarter or half an inch from the epiphysis, its place being taken by a light gray or whitish have that microscopically be seen to be florous bosos. The replacement of so much marror is perhaps the reason for some of the anemia that is prominent in severe rickets. The epiphysical centers of ossification are but slightly affected.

In the process of healing the epiphyseal coeffings slowly diminish in size and may quite disappear; the slight currentures may be entirely overcome and the greater ence much becomed. Some of the long boxes remain more or less permanently thickened and with a denser and thicker cortical layer. The bending of the ribs becomes almost imperceptible; the bosses upon the skull shrink very markedly and may leave scarcely a trace of their existence. In most cases except in Italians and regrees the active process in rickets comes to an end by the time the child is two and a half years old, often at two years.

Microscopical Apparomozz.—When normal conditions obtain at the apiphyses, the cartilegeness intercellular substance between the forest of the four layers of cartilege cells becomes infiltrated with calcium, berning rigid columns. These direct the vessels building up from the marrow against the cartilege cells which are then destroyed by enoson. The columns themselves are partly consumed by autoclasts but the remains of them set as the centers around which bone is formed by osteoblastic activity. The new home is first formed as osteoid tissue, which differs from mature home only in its containing as calcium. When it absorbs calcium it becomes true bone. It absorbs calcium so som after its formation that only a narrow layer of osteoid tissue is ever found in health. Marrow cells accompany the capillary loops. The cartilege itself is nourished by tessels that spring from the perichondrium and run transversely in the so-called cartillage causis. Throughout the whole skeleton all the bone is well calcified with the exception of the narrow zone of cetroid tissue.

In rickets the most striking feature is the presence of large amounts of limeless bone, or estooid, throughout the whole sixleton. It is more marked in some situations than others but it is a universal present. At the epiphyses the calcium is also absent from the intercellular ground substance. The marrow vesicis are not directed against the cells but they grow in all directions, locaking up the normal contour of the epophyseal line. Some of the cartilage grows down undisturbed, or islands of cartilage cells are formed and not destroyed. The cartilage is not formed in success. It is found in excess because it is allowed to remain. The transitional tone, or "rectaphysis," is weakened and nature attempts to remedy this by the production of fibrous tissue and outcod tissue. In this way the metaphysis is increased greatly in diameter and also in thickness; for, on account of its inelasticity, it expands laterally as the result of muscular action or weight and does not return to its former position. Various remains of the metaphysis is accomplished by a persistence of the cartilage canals.

When healing takes place the osteoid tissue in the flat hones and the shafts of the long bonce absorbs calcium, and the transformation into normal hone is rapidly completed. At the epiphysis the first step is the deposition of calcium in the cartilage on the epiphyseal side of the last cartilage canals permitting in the metaphysis. Vessels from these had back and destroy the cartilage. The metaphysis is thus protected from a further production of cartilage. That which remains is gradually disintegrated and mirroral hone takes the place of the osteoid tissue and connective tissue. There is no anatomical explanation of the deficient growth which is occasionally encountered. It must result from permiment damage to the function of the proliferating zone of cartilage cells.

Healing is not always a continuous process. Belapses of the disease occur. As proof of this lines of calcification may be found luried in the rachitic zone. Two and occusionally three of these are encountered. They represent abortice attempts at brailing.

Viscosal Lexicus.—These are not infrequent, but are not essential to rickets. In the image they are due to deformities of the chest wall and to complications. Beneath the deep lateral furrows which are so common, there is found a part of the lung in a state of more or less complete collapse. This is accompanied by emphysions of the portion just anterior to it. Acute and chronic broughtis and beauthopasementals are exceedingly frequent. A lew grade of chronic catarrial inflammation of the stomach and intestines is common, and is often associated with dilutation of these organs. The spleen is enlarged in most cases during the period of active symptoms. This is usually moderate in degree. The swelling of the spleen is chiefly due to simple hyperplasia. Enlargement of the liver is less frequent, and may secure with or without that of the spleen. There are no constant changes in the structure of these organs. The lymph nodes are frequently enlarged. This is due to simple hyperplasia, and has no close connection with rickets. Cerebral

changes are rare, and those described are rather of accidental occurrence than dependent upon the rachitic process. As stated under Symptoms, enlargement of the head is usually due to thickening of the cranial boxes. Although hydrocephalus is occasionally som, it is autremely doubtful whether it is more frequent than in patients not rachitic. Hypertrophy of the brain has been described in connection with rickets, but as yet this does not seem to be established by sufficient pathological evidence. The muscles are flably from imperfect nutrition, and sometimes atrophied



Pin. 20.—Commencement Jovernos in Manten Bieners. (A) curtilage. (B) sile, (C) masses of curtilage cells. (D) metaphysis or Omestical some, composed of masses of cartilage cells, orteced tissue, blood vessels and fibrous tissue. Negtual saurous in this pose is absent.—Note that the applyment line so longer exists.

from disuse, but no essential anatomical changes have been demonstrated in them.

Symptoms.—The symptoms upon which a diagnosts of rickets can be based are chiefly bony symptoms. Lessons of the bone must exist some weeks before they reach a degree that can be reorgained classically. Schmort has found microscopical evidences of rickets as early as the end of the second month. In the clinic we eddem see immistakable rickets before the fourth or fifth month. A well-marked case of rickets makes a striking picture (Plate III), and one not easily mistaken.

There are seen the large head, headed ribs, narrow clost, permitted abdemen, symmetrical strellings of the opiglayers of the wrote and ankles, and curvatures of the extremities. The beginning of symptoms is nearly attack maintains, and the patient does not usually come under observation until they have existed for several works, often several months.

Eastly Symptoms.—The most constant surfu symptoms are executing of the head, exterior restlements at night, constipation, leading of the ribs, and cranicality. The head-symming is rarely absent, and may continue for according another. It is especially profess during sleep, the perspiration standing out in large drops upon the forehead, often being softward to wet the pillow. This is one of the causes of the masal and bronchial enterth so common in rachitic infants. There is marked restlement of during sleep: the children tossing about their cribs, kicking off the clother, and never having the quiet, natural slumber of healthy infants. This may be due to many causes, but when perceived, and accordated with marked perspiration of the head, rickets should be suspected. In many rachits infants arrives nervous symptoms may be seen due to associated triany, such as larging issues stridelys, and general convolutions, Constipation is frequently seen as an early symptom, although it is more marked in the later stages of the disease.

The bearing of the rits is almost invariably the first approciable change in the bones, and it is well-nigh constant. This forms the socalled "multile rosary," consisting of nobulos at the line of junction of the costal variileges and the ribs. It may be slight, or there may be a row of knobs as large as small murkles. In many cases with marked theracie deformity, little or no bealing of the ribs is seen externally, although at automo it is found to be very marked upon the internal surface of the clast. The rester booked junctions of newly-bern infants. especially the more vigorous caes, are readaly palpable. Care should be taken not to confound these with the rachitic resery which appears only after several months. In infinite under sex months there may be found wift upots in the cramition, soundly over the acciputal or posterior portions of the parietal lones. These are from one-learth to one inch in diameter, and there are usually several of them present. By pressure with the finger they give a seri of purchment-crackling sensation. This condition is known as eranistoliss. Cranictales is a rachitic manifestation and depends in no wise your syphilis. A multile eachers is not usually present until the symptoms have stated for several mentle, and in many cases it is not seen at all.

Dironarrius.—The deformities of rickets are almost invariably symmetrical in character, and usually numerous. In extreme cases almost every hone in the budy is affected.

Hend.—This totally appears to be too large, and although it may not



Trestal Rickins

Storing the large head, names cheet, preminent abbuses, marked consequent of the epiphysis at the series and ankles. There are also correspond to be foreseme and large which are not as well shows. The particular child two and a half years old.



be greater in circumference than that of a builthy child of the access ago, it is out of proportion to the rest of the builty. In marked cases the increase in consumference may be one or two to these. The enlargement is chiefly due to thickening of the cranial bones. In one case with marked deformity, we found the skull over the particul boars half as inch in the kness (Fig. 21). This thickening diminishes with recovery, but in most cases the head remains throughout life larger than it should be.



For II.—Racemre Sacras. From colored child two years old, horizontal scettion, innomelator, showing thirkening of the horses, expectably the freeded, and open fractions.

The shape of the rachitic head is somewhat square (Fig. 22), owing to the formation of large bosses over the parietal and frontal eminence. It is flattened at the occiput from pressure, and flattened also at the vertex. In extreme cases, the prominences upon the frautal and parietal boxes may be so great as to produce quite a marked furrow along the line of the sagistal and frontal sutures, and one at vight origins to this along the curoual auture (Fig. 33). This condition gives somewhat prominence in the forehead. Marked deformity of the bond has been observed in about one-third of our cases. The software may remain open for an innatural time, occasionally until the end of the first year. The foatanel is tale in closing, being frequently found open at two and a half, and



Fig. 22.—Recurring Brain. Higher while years old; equation, prominent forefered and that worker.

sometimes even at three years. Often at eighteen or twenty months the fenturel is two inches in diameter. The veins of the scalp are often pressingent, and the hair is frequently worn from the occiput, owing to restlessness during sleep. Occasionally rickets and hydrocyclalus are associated, but the association is accidental.

Chest.—Beading of the ribs has already been mentioned. This is the most characteristic feature, but in the majority of cases there are, in addition, lateral depressions over the lower third of the chest, at the line of junction of the cartilages with the ribs, with eversion of the lower horder of the

ribs. In severe cases those depressions or farrows are so great as

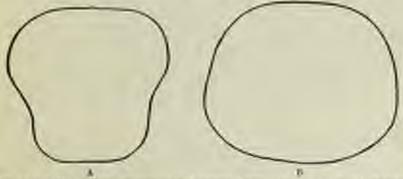


Pro. 23, - Racturer States, viscos a Carto Core Years Dans. Showing frontal and particled

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to cause serious deformity (Plate 1V). Usually there is a great diminution in the transverse, and an increase in the anteropoeterior, diameter of the chest. Fig. 24 shows the outline of the chest of a rachitic child of two years, compared with that of a healthy child of the same age, Another frequent deformity is the "rachitic girdle," which consists in a transverse depression about two inches broad, extending from one side of the chest to the other, a short distance above its lower border. The chest wall yields at the attachment of the disphragm which becomes more scarly horizontal. As a result of this the liver becomes concernal objected downward. Marked theracis deformity was seen in about twenty per cout of our cases, but in only a small propertion was the chest normal.

The factors in the production of the thoracic deformity are the con-



Par 24.—A, Hummowran Sucress of a Rassyme Currer, shall two years sill, showing lateral furnows; B, Sucress or Currer or Hummar Currer or per Sucre Acc.

traction of the displaragm, atmospheric pressure, and soft chest walls, these yielding at the point where they have least resistance, viz., at the junction of the costal cartilages and the ribs. The exciting of the costochordral junction, which is much accentrated by the displacement of the cartilages on the ribs, limits to a marked degree the capacity of the thorax. When there exists any obstruction to the entrance of air, as with broughitis, hypertrophied touchs, or adensed growths of the pharynx, the thoracic deformities are exaggerated. Irregular clost deformities depend upon the co-existence of pathological conditions in the bings. Pigeon-least is occasionally seen, but it is doubtful if this depends open rickets alone.

Spine.—In very many of the mibler cases this is normal. The most characteristic deformity consists in a posterior curve (kyphosis), which is a general one, neually extending from the mid-formal to the sternal region (Fig. 25). This existed in nearly half of our cases. In the early part of the disease it disappears controly on asspending the

child, or making extension upon the extremities; but in cases of long standing it may not disappear entirely by these bests. Very much less frequently three is seen a rotary conventure. This, in our experience, has been more frequently with the convexity to the left side than to the right—the appoints of this common form of lateral curvature seen in young girls. Marked lateral curvature in children under three years is noughly melaitie.

The clavado is affected only in severe cases. The usual deformity remists in an enaggeration of the unterior curve at the inner third of



Par. 25.-Rachemy Coura-

the bone, which is somewhat shortened and its extrematics enlarged. It is not infrequently the seat of green-stick fracture.

Deformation of the pelvia belong to obstetries rather than to pediatrics. The most common exclutic change is a diminution of the auteropeaterier diameter and a narrowing of the subpulse arch.

Extremities —Deformaties of the upper extremities are usually symmetrical. The homeom is affected only in severe case. It has a forward and outward curve, although rarely a very marked are. Both the epiphysics are enlarged, although the apper one cannot well to made out unless the child is very thin. The radius and alma are frequently affected. Thus present a convenity man

their extensor surfaces, which in some cases is very marked, particularly in children who have been creeping. Green-stick fractures are quote frequent here as they are also in the femora. They are frequently multiple and occur from very slight cases, sometimes apparently from muscular contraction. Multiple fractures may be found with no exparation, the perisenent apparently still remaining intart. They are frequently found in the findin. Rachitic changes at the epiphyse are more common than in the shalt, subargement of the epiphyses at the saist being one of the most constant bony deformities of rickets (Plat-III). Less frequently similar arcillings are seen at the elbow. Enlargement of the code of the metacorpul lonce or the phalanges we have seen but seldom and only in extreme cases.

The lower extremities are rather more frequently affected than the upper, but in a similar way. The femor is involved only in sever-cases; it commonly pre-mis a general forward and outward curve, which is mainly due to the weight of the legs as the child sits. Occasionally there is also an outward rotation of the femor, when shidness





Dermanny or the Caust is Sevens Reviews

In the upper picture, giving the external view, is thrown a thep thingse forecor at the junction of the ride and covid cortilages, these meeting if an artist staffs.

In the lower picture like rdo have been separated from the spins and spread open, showing the name deformity as it appears from within, looking forwards.

From a colored chief ten months old,



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have been allowed to sit much in a cross-legged posture. When such children begin to walk, the toes are turned very far outward. The principal deformities of the lower extremity are bow-legs and knock-knoss. Knock-knoss are more common in females, and are believed to be due to an overgrowth of the inner condyle of the femar. Enlargement of both condyles can be demonstrated in most of the marked cases of rickets. The cases of slight how-legs may be due simply to swelling of the epiphyses, the shaft of the bone being quite normal. This point we have verified by post-nucriem observations. Such are probably most of the deformities which disappear spoutaneously. The most severe cases of how-legs are often associated with some degree of antero-posterior curvature, and the latter may be the principal deformity.





Pag. 26.—Measures: Faccionaries Recurrer. Showing both arms of the same patients; fractures also of both lemons.

Enlargement of the epiphyses at the ankles is usually present when it is seen at the wrists, and nearly to the same degree. Enlargement of the upper epiphyses of the trius and the fibula is seen only in severe cases. The cause of the deformatics of the leg is not, primarily, at least, walking too early, since they are common in children who have never walked; slight deformities, however, may be aggravated by early walking. A change which has not been sufficiently emphasized is the arrested, growth of the long lanes; this is one of the most characteristic features of rickets. A rachitic child of three years after measures in height four or five inches less than a healthy child of the same age, the difference being almost entirely in the lower extremities.

All the ligaments, but particularly those about the large joints, are lax and frequently elongated. This may lend to the deformity known as weak ankles, or to an over-extension at the knee (year recursorm); also to unnatural mobility at the hips, shoulders, elbows, or wrists. The condition of the ligaments plays an important part in the production of spinal deformation.

Muscaus. The muscular symptoms of rickets are almost as constant and as characteristic as those of the hones. The muscles are small, very flabby, and poorly developed; hence rachitic children are unable to sit creet, or to stand or walk at the must age. Of one hundred and fiftyone cases in which the date of valking alone was investigated, only twenty-seven, or righteen per cent, walked before the differenth month; forty-arren per cent were not walking at the eighteenth mouth; twenty per cent, not at two years; and ten per cent, not at two and a half years. Late walking is one of the most common symptoms for which advice is sought by purents with rachitic children. The muscular power in the extremities is sometimes so feeble as to suggest paralysis. We have seen a number of cases in which the symptoms so resembled paralysis, that even expert diagnosticians were unable to differentiate richets from polcompelitis except by the electrical reactions, those in rickets being norally normal or exaggerated. In other cases the symptoms may suggest cerebral palsy of the flaccid type. The muscular symptoms may be marked when the bony changes are slight, and conversely. As no lesians of the muscles have been demonstrated, the symptoms are probably due to imperfect nutrition. Two other emptons depend chiefly upon the condition of the muscles, viz., pot-belly and constitution.

Pot-belly is quite an early symptom, and in most cases a very marked one (Plate III). It was noted in sixty per cent of our cases. The sulargement of the abdomen is uniform. It is everywhere tympunitic, and it may be as tense as a drambead. It is due to a loss of tone in the abdominal muscles, and in the muscular walls of the stomach and intestine. It is aggravated by chronic indigestion and excessive intestinal fermentation. The enlargement is thus mainly from tympunites. There may be a marked degree of dilatation both of the stomach and the color-To a very small degree only, does the large alsoman depend upon swelling of the liver or spheon.

The constitution of rickets, as already suggested, depends upon the loss of tone in the muscular walls of the intestines. It may alternate with diarrhea. It rarely happens that a rachitic child has habitaally normal evacuations from the bowds. Hard, dry, constituted stools frequently set up a condition of chronic cutarrh of the colon in which large muses of mucus are discharged.

Ferm.—According to some observers there is a febrile movement which belongs to the active stage of rickets, but we have never been able to satisfy correlves of the truth of this observation.

Decerros.—As a rule, destition is late and apt to be difficult, i. s., it is associated with attacks of inligation or other disturbances which

may be serious. Individual cases, however, present great variation in regard to this symptom. A study of the progress of dentition in one hundred and fifty rachitic children gave the following results: in fifty per cent the first teeth were cut on or before the eighth month; twenty per cent of the cases had no teeth at twelve months, and in eight per cent none had appeared at lifteen months. Even though the first teeth come at the usual time, the progress of dentition is usually retarded by the development of notests. The character of the teeth in reckets is usually good. This is in striking contrast to hereditary syphilis, where the temberar to early decer is constantly seen.

General Appearance, Children suffering from marked rickets are almost always aremic. The majority are fat and flabby. The tissues are soft and have but little resistance. Rarely, they may be thin, like patients suffering from marasures.

Bachitic patients are very prone to suffer from hypertrophied tonails, adenoid growths of the pharyin, and enlargements of the lymph nodes of the neck. In all forms of acute illness the feeble recistance of these patients is very evident. This is especially true in acute disease of the lungs.

The mucous membranes are very vulnerable in all rachitic patients. From the slightest indiscretion in diet an attack of acute indigestion or diarrhea may be brought as, and from a very insignificant exposure, estarrhal inflammation of the upper or lower air passages is excited. In rachitic patients all such attacks are prouc to run a pentracted sourse. Inflammation of the trackes and larger brought is likely to extend to the smaller brought and the lungs.

The downward displacement of the liver and spleen from contraction of the chest should not be mistaken for enlargement of these organs. Moderate enlargement of the spleen is very common during the stage of most active symptoms, i.e., from the sixth to the twelfth month. Great enlargement of other liver or spleen is infrequent.

Bacon.—Anemia is present in most of the marked cases, its intensity varying with the severity of the richitic process. The blood picture is usually that of an ordinary secondary anemia. Leucocytosis is often present; it is more marked in cases accompanied by an enlarged sphere.

Nextors Symptoms.—These are among the most frequent manifestations of rickets. Restleaness at night has already been mentioned as a preminent early symptom. Pain and tenderness are rare. A disposition to muscular spasm is seen in many cases. There may be laryngismus stridulus, general convolutions or other manifestations of tetany. It was formerly believed that rickets was the cause of the convolutions. It seems now apparent that it is the associated tetany which is intimately dependent upon rickets. The clinical evidences

of rickets may be very slight yet the persons symptoms he very marked.

Canciera Meriasonical.—Dwing to the remissions and relapses that occur in rockets and the impossibility of determining whether the disease is active or not, it has been a difficult matter to study the calcium metabolism of rickets. The experiments of Schatad show plainly that in early cases either the retention of calcium is very law or there is an actual loss. In older cases there may still be a diminished retention or it may be nearly normal, depending upon the stage of the disease. In convaluence the retention is two or three times the normal

Course and Termination.—Bickets is essentially a chronic disease, and its course is meneured by months. The active symptoms in most cases continue from three to fifteen manths, being interrupted from time to time by remissions, but these are selden appreciated clinically.

The earliest symptoms of improvement are a diminution in the nervous symptoms, especially in the restlessness at night; increased muscular power, as shown by a disposition to stand or walk; diminution in the head-swests; shappearance of the crantotabes; and improvement in the anemia. The changes in the deformities are very slow, and from month to month almost improveptible. When improvement once begins, however, it usually goes steadily forward.

Congenital Rickets.—In the middle of the last century, all hone abnormalities apparent at kirth were believed to be due to fetal rickets. Further investigation has shown that most of them were examples of chondrodystrophy or osteogenesis imperfects. Kassowitz and more recently others have maintained that rickets is usually, if not always, congenital in origin. More careful clinical observation and especially pathological studies have shown, however, that cridences of rickets are not to be found at birth. There is probably no such condition as fetal rickets.

Late Rickels,—Rare instances have been reported of bony defermition in all respects like those of rickets, developing in children from six to twelve years old. The course is slow and the deformity frequently extreme. A number of cases studied microscopically by such authorities as Schmoel and Schmidt leave no room for doubt as to the existence of the condition. It is very anusual in this country. We have never seen a case.

Acute Rickets.—Although from time to time cases have been reported with this title, from a study of the histories it is clear that the great majority, if not all of them, were cases of infantile scurry. It is doubtful whether, strictly speaking, there is such a thing as acute rickets.

Diagnosis. The diagnosis of rickets is not usually difficult. The most important early symptoms for diagnosis are sweating of the head, cranictabes, great resticement at night, delayed dentition, and enlarged RICKETS 257

Iontanel. Each of these, taken separately, may mean something else, but collectively they can mean nothing but rickets. In the later stages some of the characteristic deformaties are usually present; the most constant are besting of the rils, enlargement of the epiphyses of the wrists and ankles, and how-legs.

Special symptoms, when unusually prominent, may give rise to diffioulty in diagnosis. The enlargement of the head may be mistaken for hydrocephalus. The delayed dentition and targe footined of the cretimmay be mistaken for rickets. Muscular weakness may be so great, espeetally when affecting the logs, as to make it easy to mistake a rachitic pseudo-paralysis for actual paralysis due to a credital or spinal boson. When walking is much delayed, rickets may be passed over as simple backwardness. In nearly all of the last-mentioned group of cases the diagnosis may be established by a careful warch for the bony changes, and by the fact that in rickets there is only a general weakness of all the muscles, and not notual paralysis of any limit or group of muscles. The greatest difficulty is smally found when the muscular symptoms are marked and the keny changes slight, as is not infrequently the case. Here the question is, whether rickets is sufficient to explain all the symptoms, or whether in addition some other condition is present. The electrical reactions will usually decide the question of poliomyelitis, while the presence of cerebral symptoms, exagginated keep-jerks, and rigidity of the legs, will usually mark infantile cerebral peralysis. The bony enlargements of syphilis may be confounded with these of rickets. The bony changes of early syphilis, although affecting the epiphyses are seen at an earlier age and are generally accompanied by pain and tenderness, sometimes by epiphyseal separation, none of which are seen in rickets. The bony changes of late symbilis affort the shaft rather than the extremities of the long bones; when the bone is enlarged near the joint it is usually upon one side only. In syphilis there may be necrosis, while in rickets breaking down of bone is never seen. From scurve, rickets is differentiated by the absence of marked hyperesthesia, ecohymoses, and other hemotrlages, the changes in the gums, and most of all by the fact that anti-scorbatic dist produces no immediate change in the symptoms. The diagnosis of rachitic curvature of the spine from vertebral carries will be considered in connection with the latter disease.

Prognesis.—Rickets per se is adden, if ever, a cause of death. It is, however, a large factor in the mortality of the first two years, as it predisposes strongly to many forms of acute disease. It is an important sticlogical factor in certain serious nervous conditions, especially tetany. Escheta odds very greatly to the danger from all neutr diseases of infancy, particularly those of the respiratory tract. The encreachment upon the separatry of the lungs by a marked thoracic deformity,

may in itself be enough to keep a child in a delicate condition and retard its growth. At the same time such a condition is a constant invitation to acute attacks of broughtte or pretunents. The effect of rickets upon the future localth of the child depends choicity upon the presence and extent of the thoracic deformity. When this is severe, the child usually encumbes to some neuto respiratory disease during the first few years of life. When this is absent, although children may remain comewhat dwarfed on account of their short legs, in other respects they may be as well as if they had never been the subjects of rickets.

Treatment.—In considering the treatment of nickets, the natural course of the disease is to be kept in mind, viz., that active symptoms frequently continue only until the end of the first year, rarely larger than the eighteenth or twentieth month. The most important period for treatment, therefore, and the one in which it is most effective, is from the minth to the eighteenth month. The earlier the treatment is begun the better will be its results. General treatment after the eighteenth month, has very little effect upon the disease, for by this time most of the harm has been done. The course of the disease when untreated is toward spontaneous recovery. Most of the cases seen in private practice are of a mild type and recover without special treatment, often no diagnosis being made until later in tife, when the bory deformities or stanted growth indicate the previous existence of rickets.

Diet .- The most frequent dietetic error in mehitic patients being an excess of carbohedrates and an insufficient supply of fat, it follows that condensed milk, proprietary infant foods, and large amounts of farinaceous foods of every description should be stopped. A suitably modified cow's milk should be substituted or for young infants a wet-curse should be secured. But supplementary feeding of course milk should be given so as to insure a sufficient supply of calcium. As soon as possible other feed, such as thick gruels, scraped meat, fruit juices or stewed fruit, should be offered and vegetable scope from which the regetables have been strained out or in which they are very finely divided. Most infants are eight to ten months old before rachitic symptoms are observed; to them the above mentioned articles of diet may be given almost immediately unless digestive symptoms are marked. Breast feeling should be interrupted. Cream is often builty beene and some other form of fat must be substituted. The fat of crisp bacen upon stale bread or swiebuck serves well. The change to solid food should be made earlier than with normal children, and not more than a pint of milk should be allowed a day.

Hygiene.—In large cities it is almost impossible to secure for rachitic patients the surroundings they require. Whenever possible, such chilRICKETS 250

dres should be sent to the country; but when this is ant of the question, much may be accomplished by frequent excursions upon the water or into the country, by keeping children as much as possible in the parks and open squares of the city, and securing plenty of fresh air in sleeping rooms. Cold sponge-baths given every morning, do much to lessen their susceptibility to rhiropharyngitis and bronchitis. Sanshine, though difficult to obtain in large cities, is a most efficient therapeutic agent. The establishment of suburban hospitals and homes for these cases would do much to lessen the mertality from rickets.

Medicinal Irentment.—In a disease which tends so uniformly to recovery when causal conditions are removed, it is difficult to estimate, by clinical observation, the real value of medicinal treatment. Amonic and iron are valuable in the treatment of rickets, the special indiration for their use being the presence of marked anomia. Profuse sweating may be relieved by small doses of atropin, i. e. gr. 1/800, three or four times a day, to a child of six months. The special remodies most used are cod-liner oil, phosphorus, and preparations of calcium.

Various preparations of calcium have long been employed with the belief that they could supply lime to the tissues. It is now practically certain that calcium is present in sufficient quantity in the bleed. It cannot be utilized. Calcium, therefore, in active rickets has no value. In convalueence, during the stage of extreme calcium retention, it may he of assistance. It may be effered in the form of acetate or lactate. The two important remedies for rickets are cod-liver oil and phosphorus. No remedy for rickets has held its place so long as has red-liver oil. Phosphorus, popularized in the insulment of this disease by Kassowitz, has also some value; its most striking results are seen in the early cases and when nervous symptoms are marked. The last results are obtained by a combination of these two remedies. The officinal oil of phosphorus is used in combination with cod-liver oil, gr. 1/300 to 1/200 is given three times a day with one-half dram to one dram of the oil. Striking confirmation of the clinical observations regarding the value of this combination is furnished by the metabolism experiments of Schabad who found the percentage of calcium retention greatly increased by the use of cod-liver oil and phosphorus.

Treatment of the Rackitic Deformities.—The deformities of the chest are less amenable to treatment than are most of the others. After the third year something can be done by gymnastics to develop the chest muscles and to increase the pulmonary expansion.

The deformity of the spine (kyphonis) may usually be overcome by postural treatment. The putient should lie upon a hard bed; no pillow should be allowed under the head, but in severe cases one should be placed beneath the back, so that the head and buttocks are slightly lower than the lambar space. While sitting, the shoulders should be kept back and the trank supported. For a few minutes each day the child should be placed upon the face, and the determiny overcome by mixing the butterles while pressure is made upon the space. In severe cases, an apparatus for giving spinal support, either by a steel brace or a plasterof-Paris jacket, may be wern a few hours each day when the child is sitting up. Other means should be employed, especially friction and massage, to develop the spinal muscles.

In very seasy cases slight deformities of the extremities are outgrown
when the general treatment can be properly carried out. If the deformity is not great and not increasing, it is safe to continue with general
treatment only. If the deformity is marked or if it increases in spite
of the constitutional treatment, orthopedic apparatus should be applied.
Something may be done toward straightening the bones by intelligent
manipulation. Walking should be descentaged until the bones are quite
firm. Friction of the extremitles and massage will do very much to inerease mescular development. The habit of sitting cross-legged—a very
common one in rachitic children—should be prevented, and in fact any
other habitual poeture, on account of the danger of increasing certain
deformities. But little is to be expected from the use of apparatus for
the correction of rachitic deformities after the child is two and a half
years old; since at this time, and often even at two years, the bones are
so firm that no amount of pressure from a steel brace will have any effect.

Without going fully into the question of the surgical treatment of rachitic deformation, for which the render is referred to text-books of general and orthopedic surgery, we will only state that obsolomy seems to us to offer decided advantages over the other means of treating severe deformation. The best results from coteotomy are obtained when the operation is delayed until the fourth or fifth year, by which time the bones are sufficiently firm and solid. Operations in the second year are generally unsatisfactory, and these in the third year often so, because of the bending of the bones which takes place subsequently. The deformities which require operation are bow-legs and knock-kness, less frequently the curvatures of the fermit or the bones of the forearm.

CHAPTER VII

DIATHESES

The conception of constitutional differences is not a new one. It has been recognized for more than a hundred years that, under the same conditions, and person reacts physically in a different way from another, and that this is especially true of infants. To explain this, a peculiarity of constitution has been assumed. Before the development of bacteriology this blea was generally accepted to explain such a condition as scrofula. When it became apparent that many of the symptoms of scrofula were, in reality, symptoms of tuberculosis, the conception was gradually given up. But in the last few years emphasis has again been laid upon variation in constitution and this has come into more and more prominence. It should be recognized, however, that the basis of a division into groups rests upon climical symptoms only, and for this reason there have been great differences of opinion in regard to the limits of the various diatheses and what infants should be included in one or the other group. While many diatheses have been described, there are but two that stand out with sufficient charness to justify their consideration as entities. These are the "explainted diathesis" of Carray and the "neuropathic" or "psychoneuropathic diathesis."

THE EXUDATIVE DIATHESIS

This diathesis has been described under different names by many observers. It is the one which was first recognized. Many of the symptoms were formerly classed under the old name of "scrofulous" diathesis. But the symptoms which are now considered by Cherny to belong to the exudative diathesis depend in no way upon toherculosis. They are manifested early in life and are largely confined to besions of the skin and mucous membranes. Infants with this diathesis often show early schorrhea of the scalp, and they are particularly liable to ecorata, which may develop upon the face alone or all over the body. They are usually well nourished, oftentimes very fat infants, but their musculature is usually flabby and there is almost always anemia of greater or less intensity. Depending upon the extent of the ecrema, essinophilia is present. Less commonly, in this country at least, the papelles and lesions of lichen strophulus are formed. There is a marked tendency to thinopharyngitis and as a result there is frequently offitis media. The superficial glands, especially those in the neighborhood of the lesions, are somewhat enlarged.

The general nutrition, as has been said, is usually fairly maintained, but when the eccents is severe the irritation from this and the consequent loss of sleep may seriously affect the infant's general condition.

Though chemical changes have been described in these children, there are none sufficiently striking to justify a diagnosis without clinical symptoms. There is a tendency to retention of chlorids, and an increased sugar content of the blood has been claimed, but both of these are inconstant.

After the first year the manifestations of the exudative disthesia norally diminish in intensity; they are frequently absent after the second or third year, though they may remain in evidence for a longer period. There can be no doubt that giving a large amount of food increases the severity of the symptoms and that such children do better upon a restricted dist. Fat in excess in the dist increases the severity of the cutaneous symptoms and a diet of milk alone, after the first few months, aggravates the condition. It is wise to employ surhelpydrates as early as possible. For this reason thick graefs should be used as diluents, even in the first few weeks, and the milk replaced by them as far as this can be done. By the eighth or ninth month, or even earlier, cereal may be given with a speon once or twice a day. Thereafter, milk should form only a small part of the dict and throughout infancy and childhood the quantity of food should be regulated and restricted more particularly than with other children.

THE NEUROPATHIC DIATHESIS

The neuropathic child may give evidences of his peculiar constitution during infancy, or sometimes not until he as several years of age. No matter at what age the symptoms develop, the cause is usually inheritance from one or other neurotic parent. Environment is often important but secondary.

The Neuropathic Infant.—The condition may reveal itself even in the first weeks of life in an unusually early reaction to sights and sounds. Infants may fix their attention upon people and objects as early as the third or fourth week, and thus are readily startled and terrified by things to which the normal infant pays no attention. At other times the condition manifests itself in a tonic muscular spasm. There may be opisthotonus, flexion of arms and legs, elenching of hands, increased reflexes, all strongly suggesting a cerebral condition, and these symptons may persist for many weeks.

As they grow older such children are often precocious and on this account often receive much attention from pureuts and nurses, which

practice has a tendency greatly to increase their symptoms.

There are two symptoms which are especially likely to attract attention in early infancy, vir.: vomiting and diarrhea. The vomiting is usually characterized by the fact that it takes place very readily without any apparent discemfort and that the simplest forms of fised and even water may be vomited. Vomiting may develop without sufficient cause and the usual symptoms ordinarily associated with it are entirely absent. Frequently the food is simply regargitated into the mouth where it may be held and swallowed again or it may run out at the corners of the mouth.

The comiting may be only occasional with no interference with weight and growth, or it may be so severe as to cause a marked loss of weight and even threaten life. It sometimes ceases apontaneously; at other times it may be most obstinate. The diarrhea also turies in severity. It may occur with breast-fed as well as artificially-fed infants. The stools may be only slightly more frequent than normal, three to fire a day, and well digested; or they may be much more numerous and passed through the intestinal tract so rapidly that they are undigested and frequently contain mucus.

The diarrhea is apparently caused by an excessive irritability of the intestines, an increased reaction of the nerves to the stimuli which ordinarily produce moderate peristalsis. As a result, the food is hurried along more or less unchanged, together with increased intestinal secretions. The diarrhea may be most obstinate. Marked and even

serious malnutrition may result.

A recognition of the essential condition is necessary for proper treatment. Such infants should be kept as quiet as possible with no excitement or unnecessary handling. If remiting is present, the food should be given at four-hour intervals. When, in spite of reduction of the fat and elimination of sugar, vomiting continues, solid food given with a spoon is usually retained. This food is preferably some form of cereal such as faring or barley thoroughly cooked, but so thick that it must be given with a spoon. Infants as young as four or five months take this admirably,—two or more owness every four hours. The proportion of one part of cereal to ten parts of milk is usually thick enough; at times, however, it must be as thick as one part of the cereal to five of milk, in order to prevent regurgitation. If a flour is used, this should be cooked for at least an hour,—for tourse cereals three to four hours are necessary. This diet may be continued until other food is added at the end of the first year. Water should be given between the feedings.

The treatment of the diarrhea is conducted along the same lines as with diarrhea from other causes. The essential condition, an increased peristable, is the same in either case. The irritation of the intestinal contents should be diminished. The irritating products, the lower fatty acids, are found in smaller amount when there is an excess of protein in the diet and when the fats and sugars are much reduced. For this reason with nursing infants striking benefit is often seen after cubstricting buttermilk for one or more feedings of breast milk. With artificially fed children a reduction of the supar is usually necessary. Carbohydrates in the form of gracis are much bester borne than the sugars. When diarrhea is excessive, probein milk may be necessary, at

first without and later with the addition of a preparation of maltose. Success is only obtained with continuous and intelligent care.

The Neuropathic Child.—He is the product of both hereditary conditions and the environment in which he lives. The child who is nervous by inheritance is rendered much more so by continual association with nervous purents, especially if, being an only child, he is the subject of their undereided solicitade. Acquired nervousness is by no means infrequent as the result of disease or laid environment, but is lost as seen as the influence that is responsible for it is removed. Nervousness is more common in girls than in boys and is especially seen in the Hebrew and Latin races. It is much increased by a faulty method of living, by late hours and especially by tea and ruffee and, in boys, by eightest smoking.

The symptoms relate not only to the nerrous system but to the physical condition of the child as well. Neurotic shildren are almost always poorly nourished. They have labile easomotor systems and for that reason blush readily and very often have cold hands and feet. The pulse is apt to be rapid and undergoes a marked increase in rapidity after slight exertion, or as the result of the slightest nervous impression. These children are usually anemic; their appetite is poor and they often suffer habitually from constitution. It is not infrequent for diarrhea to occur, particularly as the result of sacitoment. Cardiac palpitation is frequently complained of. Nervous vomiting is seen with children, girls especially, of the school age. It occurs in the meeting immediately after breakfast, is accomplished without effort and there is usually no nausea. The appetite may remain fair and there is no vemiting at any other time. Necturnal encrosis is found with many neurotic patients, and masterbation is not infrequent even in those of two or three years.

Mentally, neuropathic children are apt to be bright, often prececious, but they usually show a great lack of concentration. They are frequently animated, talk rapidly, oftentimes stammering. They are never quiet, are full of restless energy, changing rapidly from one occupation to another but soon tire and constantly complain of fatigue. Headache is frequent and often persistent. Vague pains in almost every situation are complained of. Some of these children are confirmed hypochondriacs. Many are affectionate and attractive, but they are usually self-willed and often tyrannics over the household. They are greatly affected by nervous impressions, often timid and readily cry or laugh. Tremor of the hands or syclids is not uncommon and the facial phenomenon (Chrostek's symptom) is present in many. All sorts of habit spaces are of frequent occurrence and in rheumatic children chores is a common manifestation. Sheep is usually poor. Such children have great difficulty in going to sleep and occasionally have night terrors. In general, nervous children demonstrate a combination of irritability to all impressions with a ready exhaustion. Untreated, they are apt to grow up into nervous, often hypochendriacal adults. Even with the greatest care and wisest treatment it is a long and tedious process to bring about an approach to the normal.

Treatment consists largely in the wise management of the daily life. It is frequently necessary to remove the child entirely from the environment in which he has been living. The person in charge should be one who will not speel or indulge the child and will bring about a proper regime with a gentle but firm control. It is necessary to observe with the greatest care all of the measures which promote the physical welfare of the child and especially to prevent any nunecessary stimuli to the nervous system.

Nervous children are much beautited by association with others of their own age. No greater mistake can be made than to keep such a child by himself for a prolonged period; but it must be remembered that he is usually unable to bear eather the physical or the mental strain to which normal children are constantly subjected. For that reason the periods both of study and play should be short. Education at home is usually undesirable; but school hours must be carefully adjusted to the child's endurance. He should not be allowed to become either physically or mentally exhausted. Frequent short periods of rost are necessary; it is often desirable to keep a child in bed for two or three days once or twice a month. Particularly to be avoided are such things as motoring, children's parties, theaters, moving picture shows, etc. Altogether the most satisfactory way of bringing up such a child is in the country away from the excitement and distractions of city life.

Drugs play a very insignificant part in treatment and should be given only for particular symptoms. Tonics, when indicated, may be given, but sofatives to the nervous system should be avoided. It is quite useless to expect relief from such operations as the removal of the tonsils, adenceds, circumcision, etc. Unless the necessity for them

is plain, they often do more harm than good.



SECTION III

DISEASES OF THE DISESTIVE SYSTEM

CHAPTER I

DISEASES OF THE LIPS, TONGUE, AND MOUTH

MALFORMATIONS

Harelip.—This is one of the most frequent congenital deformities. It is caused by an incomplete fusion of the central process with one or both of the lateral processes from which the upper half of the face is developed. This deformity may be single or double; the fassure is never in the median line, but usually just beneath the center of the nostril. There may be simply a slight indentation in the lip, or the fassure may extend to the nostril. Both single and double harelip—more frequently the latter—may be complicated by fissure of the palate. Double harelip is usually accompanied by a fassure between the intermaxillary and the superior maxillary hone of each side.

Cleft Palate.—This is second in frequency to harelip. It may involve the soft palate only, or the fissure may extend into the hard palate, producing a wide gap in the roof of the mouth. The most frequent form

is that in which only the soft pulate is affected.

For the surgical treatment of both those deformities the reader is referred to text-books upon surgery. As to the time of operation with either hardip or cleft palate,—in general, operation should be performed as soon as the condition of the child will admit. With a vigorous child, it should be done in the first two weeks of life.

If the child is premature or feeble, it is not wise to operate at once, but it is always to be remembered that it does not necessarily follow that the child's condition will be better at another time. The notrition is always a matter of much difficulty and without operation a very large number of these cases die of inantition and nursamus, even with the best care. The medical treatment consists in the care of the mouth and in the nutrition of the patient. The mouth, in all cases, must be kept scrapulously clean, but the greatest care is necessary not to injure the epi-

thelium. A camel's-hair brush and plain, inke-warm water, or a weak alkaline solution, are to be recommended. Both of these deformities are exceedingly likely to be complicated by thrush. This is a serious menuce to the success of any operation, and even to the life of the patient. In cases of hardlip, if the fissure is so great as to interfere with nursing, the mother's milk should be pumped and the child fed with a spoon or a medicine dropper until the operation can be performed. In cleft palate there may be attached to the rubber nipple of the nursing bottle a flap of thin sheet-rubber in such a way that it closes the fissure in the mouth when once the nipple is in place. This flap should be shaped like a leaf, one extremity being seved to the neck of the rubber nipple and the other end left free. In many cases, both before and immediately after operation, feeding by gavage may be resorted to with the greatest benefit and with very little inconvenience.

Congenital Hypertrophy of the Tengue.—This is usually due to discase of the lymphatics, and is to be regarded as a lymphangions. In a few cases hypertrophy of the mass-ular fibers has been present. The tongue may reach an enormous erro, so that it is impossible for it to be contained within the cavity of the mouth, and it may thus interfere with nursing, deglutition, and even with respiration. The treatment is surgical; but some of these patients have been strikingly benefited by radium.

Cases like the above are to be distinguished from those of enlargement of the tongue seen in sportable cretinism. In this disease the tongue is considerably enlarged and may peetrade slightly from the mouth, but it is rarely, if ever, large enough to cause other symptoms. It diminishes notably under treatment with thyroid extract.

Bifid Tongue.—These cases are extremely rare. Brothers has reported to the Neg York Pathological Society a case of cleft tongue in a child of one month. There was, in addition, a fissure of the soft palate.

Tengue-tie.—This determity is due to such a shortening of the frenum that it is impossible to protrude the tongue to a normal extent. It differs considerably in degree in different cases. In some, the tongue can not be protruded beyond the game. Tongue-tie may interfere with articulation, and even with surking. The treatment consists in liberating the tongue by dividing the fremum with scissors and completing the operation with the finger mail. This should be done in every case unless the child is a biseder. In many cases the mother may think the tongue tied when the fremum is of normal length.

Bifd Uvula.—This is not very uncommon. It usually occurs in connection with eleft pulate, but is occasionally seen when there is no other deformity present. It may be complete or partial, and it does not of itself require treatment.

DISEASES OF THE LIPS

Herpes.—Herpes labialis is an exceedingly common affection in children, occurring in acute febrile discuses, particularly procumonia, and sometimes alone. It is the familiar "fever sore" or "cold sere" of domestic medicine. The appearance is similar to herpes in other parts of the body. There is first a group of vesicles, then rupture and the formation of crusts. It is often quite difficult to cure on account of the disposition of children to pick the lip with the fingers. Although it heals without treatment, recovery is facilitated by the use of some antiseptic lotion, such as dilute boric acid, followed by a dusting powder of zinc exid and boric acid. This treatment is generally more successful than the use of eintments. Young children should wear mittens or obser splints at night, to present picking at the crusts.

Recema of the Lip.—This is an exceedingly common condition, and a very troublesome one. The vermilion bender is day and rough, and prone to deep cracks or fiscares. These are usually seen at the angles of the mouth or in the median line. When severe they are exceedingly painful, bleed freely, and are the cause of very great disconfort, especially in the cold senson. The lips should be covered at night by borie need ointment, and this should be used as much as possible during the day. When deep fissures form, they should be toucised with beant alum, or with the solid stick of nitrate of silver. Syphilitic fissures

are considered with the symptoms of that disease.

Pericebe (French, periceber in to fick).—This name was first given by Lemaistre to a form of ulceration occurring usually at the angle of the month. It begins in most cases as a small faster, which, by constant licking and irritation, to which there is usually added infection, may develop into an intractable aleer of considerable size. It often resembles the mucous patch of hareditary syphilis. The ulcer is of a grayish color, is quite painful, and is associated with considerable swelling of the lip. It lasts from two to four weeks. The treatment is the same as in simple figure—viz., the use of burnt along or nitrate of silver, and covering the part with bismuth or ease of sine.

DISEASES OF THE TONGUE

Epithelial Desquaration.—This is a disease of the lingual spithelium, which is characterized by the appearance upon the dersum or margin of the tongue, of circular, elliptical, or crescentic red patches, with gray margins which are slightly elevated. The gray margins are apparently due to thickening of the spithelial layer and the red areas to desquamation of the spithelium. It is sometimes improperly called provincia of the tongue. It is quite a common condition, and is probably congenital.

As usually seen, there exist upon the tongue from two to half a dozen of these red patches surmounded by a gray border, which is about onetwelfth of an inch wide, and slightly elevated. The outline of the patch is nearly always cross-suite (Fig. 27). From day to day the configuration of the patches changes; the gray lines advance across the tongue from side to side, or from base to tip, disappearing as they reach the border or the extremity. They are followed by the red patches,



Fig. 27.—EPRIMITAN, Designa-MATION OF THE TOWNER, (GRAMMA,)

and as the old ones fade away new ones form and run the same course. The red patches are of a bright color nearest the border, gradually shading off into the normal color of the tongue. Only the epithelium is involved, the deeper structures being unaffected. The duration of the disease is indefinite; it nearly lasts for years. Guinon reports several cases which recovered during an intercurrent attack of measles or scarlet fever.

The cause is unknown. The condition occurs rather more frequently in females than in males, and Guhler has reported an instance of several members of the same family being affected. The condition has

been thought to depend upon nearly every disease of childhoof. It is not accompanied by poin, salivation, or by other symptoms of stematitis, and is of little practical importance. Its symptoms are so thuraccertate that it can hardly be mistaken for any other condition. Treatment is unnecessary.

Two other forms of epithelial desquarantion have been observed, toth much more rare than that described. In one of these the red denoded portion eccupies the margin of the tongue, while the center is gray or white; the irregular wavy outline which separates the two suggrets strongly an outline map, and the condition is sometimes called the "geographical tongue." This term is frequently employed to designate the common form. In another variety nearly the whole organ may be uniformly red, from loss of the epithelium, there being no beckets or patches. Both these varieties are of much shorter duration than the more common form, usually lasting only a few weeks.

Glossitis.—Inflammation of the tongue is not very common in children. It is usually of traumatic origin. The injury may be due to biting the tangue is a fall or in an epileptic seizure. Glassitis is sometimes excited by the irritation of a sharp touth, causing a wound which may be the avenue of infection; or it may result from taking into the mouth irritant or caustic potents. In a small number of cases no cause can be found. The symptoms are marked swelling of the tangue, so that it may postrade from the mouth; and it may even be so great as to cause severe dyspice. There are also seen profess salivation, difficulty in swallowing and in articulation, and often considerable local pain. There may be a rise of temperature to 102° or 103° F. The treatment consists in the use of fluid food, which in severe cases may be introduced through the case by means of a catheter. Ice may be used externally, or, better still, pieces of ice may be kept in the mouth continually. If there is electraction to respiration, and in all severe cases, scarification should be done on the dersum of the tangue along the side of the raphé.

The acute swelling of the toughe and hips occurring in some cases of articaria may be mentioned in this connection. This is a rare condition in children, but it may develop rapidly and to such a degree as to cause alarming symptoms. The treatment commists in the use of ice locally, free purgation by salines, and, in extreme cases, needle punctures to relieve the edoma.

Tangue-swallowing.—This term is used to describe a rare condition seen in infants, in which the tongue is turned backward into the pharynx, so as to obstruct respiration. It may be drawn quite into the esophagus. Several marked cases have been collected by Hermig. While most frequently occurring with paroxyens of pertussis, tongue-swallowing has been seen in other diseases. This should not be forgotten as one of the explanations of sudden asphyxia in a young infant. The conditions necessary for its production are a somewhat relaxed organ or a long fremum. In none of the fatal cases reported, however, had the fremum been divided. In some weak infants, falling back of the tongue, so that its base partly covers the spiglottis, produces asphyxia, precisely as it occurs in adult life under full anesthesia. The recognition of the condition is a very easy ton, and its treatment is to relieve the obstruction by drawing the tongue forward by the finger or forceps.

Ulter of the Frenum.—The friction against the sharp edges of the lower central incisors frequently causes an after of the frenum in infants. We have never seen it in older children. It usually occurs in pertussis, but is seen in other conditions. In some it appears to be produced by friction of the teeth during nursing from the broast or bottle. It is more often seen in children who are delicate or enchectic than in those who are bealthy and well nourished. The older may be confined to the frenum, or it may extend quite deeply into the tongue. It is

neutily about encefourth of an inch in diameter, and of a yellowish-gray color. When not readily cured by touching with alone or nitrate of silver, the shift may be fed by gavage for several days, or the teeth may be covered by a bit of absorbent cetten.

DENTAL CARLES

Although the tooth do not strictly belong to the province of the physician, they have an important influence upon the general health. The permission effects of dental caries have only recently been appreciated. Boutme examinations of public-school children, made in various cities, have shown that fully 80 per cent have extensive dental caries. Among the instances of institutions the proportion is fully as great as this, possibly greater, unless, as in a few modern institutions, special attention is given to this subject.

Among the causes of dental caries the most important without doubt is want of cleanliness—the almost entire neglect of the teethbrush among the children of the poor. This leads to decomposition of food and secretions, acid ferneptation, erosions of the enamel, etc. But not all caries of the teeth can be ascribed to this cause. Diet has certainly much to do with it. It is our belief that the opinion commonly held, that excessive indulgence in sweets is responsible for dental caries, is well founded. Malnutrition and improper food, especially in early childhood, certainly affect the teeth. In some children a congenitally defective enamel is present. Hereditary syphilis is also a cause, and in children with congenital mental defects the both are prose to early decay.

The symptoms are both local and general. Locally, as a result of decomposition and infection, there are present foul breath, gingivitis, alwedar aboves, alcerative etematitis, toethache, etc. The lymph nodes in the neighborhood frequently become enlarged and sometimes taker-culous. Tuberculous of the submaxillary and submental lymph nodes is nearly always the result of infection through the teeth or the game. Whether the cervical lymph nodes are infected in the same may is very doubtful. The general symptoms result in part from improper maximation of fixed and in part from sepsis from the local condition. There may be seen only failing notrition, loss of appetite and anemia; or these symptoms may be accompanied by a slight but continuous fever which may persist for smooths. In more marked cases there may be symptoms of a pyemic character; higher temperature, joint swellings, tracting, ste. Many cases of illness diagnosticated acute rheumatism and accompanied by cardine complications have their origin in oral

sepsis at the basis of which are carious teeth, and no treatment has any influence upon the condition until these are removed.

From the local irritation various nervous symptoms may arise. The most common are habit spanin, facial chorus, headaches, and, according to some writers, even epileptiform convolutions. The presence of carious teeth is a menace to the general health. They certainly pre-dispose to local intervalues. Many persons assume that if the teeth affected belong to the first set, it matters little. However, the permanent teeth are often injured by extensive decay of the decideous set. The treatment of this condition belongs to the dentist; but the physician should appreciate the importance of the subject and args parents and others in charge of children to give proper attention to cleanliness and to see that carious teeth of the first set are either filled or removed.

ALVEOLAR ABSCESS

This is common in children, especially among the class of hospital and dispensary patients, in whom little or no attention is given to the care of the teeth. It causes severe pain and acute swelling, which may be limited to the gum, or it may involve to a consolerable extent the periosteum of the jaw and even cause swelling of the whole sole of the face. If there is retention of pus, there may be quite severe constitutional symptoms, such as childs and high temperature; but in most of the cases these are wanting. The abscess usually spens spontaneously into the mouth, but it may open externally if the molar teeth are the ones affected. It may even lead to necrosis of the jaw. If its site is the upper jaw, the pus may find its way into the mosal cavity or into the maxillary sines.

The treatment is, in the first place, prophylactic. This requires attention to the teeth to prevent decay, and the removal of old carious fangs, which are a constant menuce to the health of the child. The free use of the toothbrush and some antiseptic mouth-wash will, in the great majority of cases, prevent the occurrence of this disease. It is important that the abscess he opened early and free drainage secured. If there is a carious tooth it should be drawn.

DIFFICULT DESITTION

The place of dentition as an etiological factor in the diseases of infancy is one which has given rise to much discussion. From a very early period the view has descended, that a large number of the diseases occurring between the ages of air manths and two years are due to difficult dentition. The list of such discuses is a long one, but year by year it has been shortened as one after another has been shown to depend upon other causes, dentition being only a coincidence.

At the present time many good observers deay that dentition is ever a cause of symptoms in children; some even going so far as to say that the growth of the teeth causes no more symptoms than the growth of the hair. Without doubt the usual matake made in practice is to overlock disease of the brain, ears, longs, stomach, and intestines, because of the firm belief that the child was "anly teething." The physician who starts out with the idea that in infancy dentition may produce all symptoms usually gets no further than this in his etiological investigations. Although no doubt the importance of dentition as an etiological factor in disease has been in the past greatly exaggerated, the careful and candid observer must admit that, particularly in definite, highly nervous children, dentition may produce many reflex symptoms, some even of quite an absuming character.

Speaking from general impressions not from statistics, we should say that in our experience fully one-half of the healthy children cut their teeth without any visible symptoms, boal or general; in the reuninder some disturbance is usually seen, and though in most cases it is slight and of short duration, it may last for several days or even a week. The symptoms most commonly seen are disturbed sleep, or watefulness at night and fretfulnous by day, so that children often sleep only one-half the usual time. There is loss of appetite, and much less fool than usual is taken. There is often, but not always, an increase in the salitary secretion, a slight amount of catarrhal stomatitis, and a constant disposition on the part of the shild to put the fingers into the mouth. The bowls are aften constipated or there may be slight diarrhes. The thermonaster may allow a slight elevation of temperature to 100° or 101.54 F. The weight often remains stationary for a week or two, and there may even be a loss of a few concess. The duration of these symptoms in most cases is but a few days, and they require no special treatment. If the food is forced beyond the child's inclination, attacks of indigention with remiting and diarrhea are easily excited.

Symptoms more severe than the above, are rare in healthy children, the half are not infrequent in those who are delicate or rachitic. In such an explicitly children, even so slight a thing as dentition may be an exciting cause of quite serious disturbances. Often there is some other factor in the case, such as had feeding or feeble digestion. In delicate or rachetic children there may be seen the symptoms already mentioned as occurring so healthy infants, but in greater sweerity; and in addition there may be seen attacks of acute indigestion. Occasionally there is

an elevation of temperature to 102° or 103° F., lasting usually only two or three days, and accompanied by no symptoms except almost complete ancresin. It is occasionally, but rarely, seen that a child will have convulsions just before or during the eruption of each tooth. Such children are almost always the subjects of latent tetany, deutition acting as any other exciting cause to determine the onset of the convulsions. In cases of secona the symptoms often undergo a distinct exacerisation with the eruption of each group of teeth. As regards almost all the other diseased conditions which are commonly attributed to deutition, we believe that it is a delusion to ascribe them to this cause.

The physician should watch a child carefully, and examine him frequently, to be sure that he is not overlooking some serious local or constitutional disease before he allows himself to make the diagnosis of difficult dentition. Probably in ninety-live per cent of the cases in which symptoms are present, they are due to some cause other than dentition. When, however, symptoms such as any of those mentioned disappear immediately when the tooth come through, and when we see them repeated four or five times in the same child with the cruption of each group of teeth, and accompanied by red and swollen gums, we can not escape the conclusion that dentition is a factor in their production, though perhaps not the only one.

In the treatment of this condition drugs occupy but a small place. It should be remembered that infants are at this time in a peculiarly susceptible condition as regards the digestive tract, and attacks of indigestion, and even severe diarrhow, are readily excited from slight enuses, especially from overfeeding. Special care should be exercised in this respect. The strength of the food should be reduced, as well as the amount given. A poor appetite indicates a feeble digestion, which should not be overtaxed. As attacks of broughitis and acute mosal catarrh are readily induced, even slight exposure should be guarded. against. The persons symptoms, when severe, may be relieved by the use of moderate doses of the bromids or by phenacetin, better than by opintes. All soothing syraps should be discountenanced. All the turious devices for making doutition easy are a delusion. In a small number of cases lancing the gums is of value. We have seen in a few rare instances marked and undoubted relief given by it. This is likely to be the case only when the gums are toose, swollen, and very red, with the teeth just beneath the muceus membrane. To press a tooth through the rum by simply rubbing gently with the finger covered with sterile gauge is frequently more effective than an incision. It seldom happens, howver, that the relief expected is seen from any of the measures mentioned.

CATARRHAL STOMATITIS

This is characterized by reduces and availing of the mucous membrane, and by increased secretion of the salivary and the mucous glands of the month. It usually involves a large part of the mucous membrane.

Etiology.—Cataryhal stematitis may result from transmitism. This injury may be mechanical, or due to heat or any irritant accidentally taken into the month. It frequently occurs at the time of the eruption of a tooth. It complicates measles, scarlet fever, diphtheria, influence, and many other infectious discuses. In these cases and in many others the discusse is probably due to direct infection.

Lexions.—The lesions are essentially the same as in cutarrhal inflammation of other muccus numbrates. There is congestion with desquamation of epithelial cells and senetimes the formation of superficial ulcers. The process may be a very superficial one, or it may extend to the submucous tissue.

Symptoms.—The nuccous reconstrate is intensily injected, all the capillaries are dilated, and small bemorehages easily excited. The muyour membrane is smallen, this being most apparent over the game or about the teeth. There may be some excelling of the lips. The mouth seems hot, and the local temperature is certainly increased. There is considerable pain, as shown by fretfulness, left particularly by the disinclimation to take food: infants, though wridently bungry, either refusing the breast or bottle altogether, or dropping it after a few moments. The increase in secretion is sometimes marked, so that the salita pours from the mouth, irritating the lips and face and dreaching the clathing. In other cases the adira is avallowed. On close inspection there may be seen swelling of the maripurous follicles, and even the formation of tiny systs from the accumulation of secretion within them. The tongue is avually coated, the edges reddened, and the pupillar prominent. In febrile diseases, such as typhoid, etc., we may get an accumulation of dead spithsform with the formation of cracks and fisures of the tanger. and the lips may present a similar condition. The neighboring lymphatic glands are slightly enlargest and tender. The constitutional sympfome accompanying simple stomatities are not severe, but some disturbance is almost always present. There may be derangement of digestion with remiting, and even a mild attack of diarrhes. In the majority of rates the disease runs a short course, recovery taking place in a few days when the primary cause is removed. In very delicate children it may be prolonged, and from the interference with nutrition may even lead to serious consequences.

Treatment.—The mouth and teeth should be kept clean. Food is more acceptable if given cold. In very sovere cases, when food is refused, gavage may be resorted to three or four times daily. In all cases children may be given ice to suck. This is refreshing, both on account of the cold and from the relief to the thirst. The mouth should be kept clean with a solution of boric arid, ten grains to the ounce, or an alkaline solution, such as Dobell's, diluted with an equal amount of cold builted water; or plain water may be used. In the senser forms, where there is much swelling and slight estarrhal alceration, astringents are required. In our experience alum is the best; this may be applied in the form of the powdered hurst alum mixed with an equal amount of bismuth, or in arbitron, ten grains to the comes, with a swah or brush. Where ulcers are slow in healing and very painful, the powdered burnt alum or the solid stick of nitrate of silver may be applied directly.

RESPECTIC STOMATERS.

LAphthous, Venicular, or Followler Stometitis)

In this form of stomatitis we have the appearance first of small yellowish-white isolated spots, and subsequently the formation of superficial ulcers. These ulcers are first discrete, but may coalesce and form others of considerable size. It is a self-limited disease, usually running its course in from five days to two weeks.

Etislogy.—Very little is as yet positively known regarding the cause of herpetic stomatitis. It is not common in the first year, but after that is very frequently seen throughout childhood. It occurs in the strong as well as in the delicate. It is often associated with some disturbance of the atomach, and occasionally with dentition. We have adopted the term herpetic, because the condition is analogous to herpes of the lips and face, the difference in appearance being due chiefly to location. It is apparently caused by something which acts upon terminal nerve filaments.

Lesions.—The generally accepted opinion is that there is first a resicle, followed by a death of epithelial cells covering it, and then a superficial older. The white appearance is due to the fact that the olders, being on a mucous membrane, are always most. These olders may extend superficially, but never deeply; they beal quickly with the formation of new epithelial cells, leaving no countriess. Herpetic stomatitis is always associated with more or less catarrial inflammation.

Symptoms.—The disease is characterized by local and general symptoms. The latter are quite indefinite—general indisposition, loss of

appetite, and alight fever. The local symptoms counst in the development of small, shallow, circular ulsers, natually coming in successive crops. While most frequent at the leader of the tongue and the inside of the lips, they may be found upon any part of the miscous membrane of the month or the plaryny. There may be only half a dozen present, or the mouth may be filled with them. They are first of a vellowish color, and on an average about one eighth of an inch in diameter. By the conference of acceral smaller ofcers there may form patches of considerable size, cometimes nearly covering the lips. The older ulcers are apt to have a dirty-gray color, and in places may look not unlike a diphtheritic membrane. The smaller ones are surrounded by a red areola, and when bealing the margin a of a bright red color. Their appearance is often more like that of an explation upon the muons membrane flun an obseration. The other symptoms are much the same as those of catarrial stonastitis, but usually of greater swerrity. The pain is particularly intense, it being aften difficult to induce children to take anything in the form of food. The tongue is frequently coated, but there is perce the foul breath of ulcerative stomatitis. The duration of the disease is from one to two works, and, if the child is in good condition, complete recovery takes place even without any special treatment. In builty neurished shaldren the disease may last for two or three weeks; relapses may occur, and the condition may interfere very seriously with the child's nutrition.

Treatment.—Thus is the same as in catarrial atomatitis, with the addition that to each one of the ulcers finely possibered burnt alum should be applied with a camel's-bair brush. If this is not effective, the solid stick of nitrate of after may be used. The ulcers will nearly yield rapidly to this treatment. In our experience, frugs given with the purpose of affecting the lesion in the mouth have been without benefit.

ULCERATIVE STOMATITIS

Ulcerative stomatitis is believed to occur only when teeth are present. It is characterized by an obserative process, beginning at the justion of the teeth and the gum, and extending along the teeth; it occasionally involves other parts of the mouth, but never spreads beyond the buccal cavity.

Etielogy.—A form of aborrative stomatitis is produced by certain metallic poisons, especially mercury, lead, and phosphorus; but all these are now rare. Ulcerative stomatitis also severs in scurry; and it assurprobable that an allied disturbance of autrition, with spongy, swellen genus, precedes some other forms of alcerative stomatitis. Bad our reunlings and improper food act as predisposing causes; for the disease is quite common in institutions for children and in hospital and dispensary patients, although rare in private practice. Local causes of importance are want of cleanliness of the mouth and tooth and the presence of carious both. Conditions which produce a lowered ritality of the guns act as predisposing causes, and infection as an exciting cause of the disease. The constant clinical features of ulterative stomatitis and the occasional occurrence of epotennes indicate a specific cause which is probably the same as that of electroneuloranous torallitis. The two conditions often exist at the same time. From the investigations of Vincent, Bernheim, Plant and others it seems probable that norm is also produced by the same organism but represents a more virulent infection.

Lexions.—The disease may begin at any part of the mouth, but most frequently upon the enter surface of the gum along the lower incoor teeth. From this point it extends behind the teeth, and from the incisers to the camines and melans, usually of one side only; but it may involve the entire gum of both jaws. From the gums the process may spread to the lips, affecting the fold of musous membrane between the gum and the lip, and also to the inner surface of the check, especially opposite the molar teeth, where large alters often form. In neglected cases the disease may extend into the alveolar suckets, the teeth lossesting and falling out. The periodoum of the alveolar process may be involved, and even superficial necrosis of the jaw may occur, as has happened in several cases that came under our observation. These severe forms are not with in institutions chiefly and then generally follow meades or scarlet forer.

Ulters similar in appearance may also be present in other parts of the mouth—i. c., on the soft palate or the tonoils, sometimes even when the gums are not involved.

Symptoms.—The first things neticed are the very offensive breath and the profuse salivation. It is usually for one of these symptoms that the patient is brought for treatment. On inspection of the month, there are seen in the mild cases, swollen spongy gams of a deep-red or purplish color, which bleed at the slightest touch. There is a line of olevration, usually along the incisor teeth, most marked in front, which may extend to any or to all of the teeth; semetimes it affects only the gam along the melar teeth, the incisors escaping. At the junction of the beeth and gam is seen a dirty, yellowish deposit, on the removal of which free bleeding takes place. The discused parts are very painful, and the rhild cries and remate any attempt at examination. In the more severe cases and in those of longer duration the teeth are busened, sometimes being so losse that they can be picked from the gam. There may be necross of the jaw, and even a loose sequestrian may be found. In

these cases the alceration along the gums is deeper, and there may be olders in the cheek opposite the molar teeth, or inside the lip. The swelling may be so great that the teeth are almost covered; this is seen particularly in the scorbutic form. The saliva pours from the mouth, adding greatly to the discomfort of the patient. Beneath the jaw are felt the large, swellen lymphatic glands, which are painful and tender to the teach, but show no tendency to suppurate. The tengue is somewhat swellen, and shows at the edges the imprint of the teeth; it has a thick, diety coating.

The disease is attended by little or no fever or other constitutional symptoms. The general condition of these patients is often poor, and there may be quite a marked nuchexin. Other forms of stomatitis may be associated, and it should not be forgetten that the gangronous form may follow.

When not recognized or not properly treated, alcerative stomatitis may last for months. When properly treated it tends in all recent cases to recovery, usually in from five to ten days. No deformity of the mouth is left, the only untoward results being shrinking of the gum, semetimes loss of some of the incisor teeth, and more rarely a superficial necrosis of the alveolar process. All these are quite uncommon. Ulcerative stomatitis can hardly be confounded with any other form, and not only should a diagnosis of the lesion be made, but the condition upon which it depends should, if possible, he discovered; accordates, particularly, should not be overlooked.

Treatment.—The first thing to be done is to remove the cause. When dependent upon metallic poisoning the source should be discovered. Scorbutic cases should have the neual anti-scorbutic diet. Cleanliness of the mouth is of great importance, and this may best be accomplished by the use of peroxid of hydrogen dilated with from one to four parts of water. It should be followed by therough runsing with plain water, and repeated several times a day. In other cases a solution of alum, five grains to the source, or a mouth-wash of chlorate of potash, three grains to the ounce, may be employed. The only objection to the last montioned is the pain which it sometimes produces. A strip of game between the check and the gams aids greatly in cleanliness. This may be left in place and affectle no inconvenience, but on the contrary, comfort to the patient.

The specific remedy for ulcerative stomatitis is chlorate of potash. The best method of administration is to give two grains, or one-half tenspoonful of a saturated solution, largely diluted, every hour during the day for the first twenty-four hours and subsequently every two hours; when improvement occurs the dose may be still further reduced. Marked benefit is usually seen in one or two days even in cases that have lasted

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for several weeks. If the case does not yield readily to this treatment there is probably disease at the roots of the teeth, and when loose these should be removed, and the jaw examined to see if there is necrosis. Occasionally when there is no disposition to heal, the shreds of necrotic tissue should be carefully removed, and burnt alum or nitrate of silver applied.

The constitutional and dietetic treatment in all these cases should be the same as that employed in ecurry—i. e., plenty of fruit, fresh vegetables, and sometimes the internal administration of mineral acids, especially aromatic sulphuric acid. Iron is indicated in most of the cases-

Ulceration of the Hard Palate.-This is usually seen in the first few weeks of life, but may occur in any child suffering from manasmus. The primary cause is often the injury inflicted in cleansing the mouth. In other cases it is due to the friction of the rubber nipule, or some other object which the child is allowed to sack. In still others it is apparently produced by the liabit of tangue-sucking frequently observed in these young infants. The grocurances are quite characteristic: there is found, rather far back upon the hard palate, usually in the middle line, a superficial ulcer, from a fourth to a half inch in diameter. There are no signs of acute inflammation. Thrush may coexist, but it has no relation to the production of the disease. Spontaneous recovery usually occurs in from one to three weeks, provided the cause can be removed. In children suffering from marasmus these ulcers are very intractable, and in many instances their cure is practically impossible. It is therefore especially important to prevent, if possible, their formation by care in cleansing the mouth, and in avoiding the other causes referred to. When ulcers have appeared they should be treated as in cases of herpetic atamenticis.

THRUSH

(Sprus; German, Soor) French, Muguet)

Thrush is a parasitic form of stematitis characterized by the appearance upon the nuccus membrane, usually of the tongue or the checks, of small white flakes or larger patches. It is common in infants of the first two or three menths, and in all the protracted exhausting diseases of early life.

Etiology.—The exact class to which the vegetable parasite which produces thrush belongs has not yet been definitely settled. Robin's opinion was long accepted that it was the codium abbinant; the view of Grawitz, that it is the succharomyces abbicant, is now more generally adopted. If a little of the exache from the mouth is placed upon a slide and a

som. With the low power of the structure of the fungus is readily som. With the low power of the microscope there can be made out fine threads (the siyes/sum) and small oral bodies (the spores). With a high power the threads can be seen to be made up of a number of shorter reds at the ends of which the spore formation takes place (Fig. 28). The mycellum is produced from the spores. The spores of this fungus are of very common accurrence in the atmosphere. It is disboult or impossible for thrush to develop upon a healthy mucous membrane. Its growth is favored by slight atensions, such as are often produced by rough methods of electronic the mouth; also by catarrial storestits, a



Fig. 28.—Time on Persons (highly magnified) or represent; b, spores; c, epithelial cells itsus the mouth; d, temocytes; s, detritus, (v, Jakoch.)

scanty salivary secretion and want of clambiness. The nature of the process which a produces is in all probability a sugar fermestation, the seid reaction of the mouth being the result of the growth rather than its cause. Infection may come from another patient by means of a rubber nipple at a cloth which has been used for the infected mouth, from the nipple of the nurse, or directly from the nir. Its production is favored by a scanty seemtion of saliva, hence it is frequent in the first two or three

months of life; also by an altered secretion such as is seen in protracted wasting diseases, enterocolitis, marasmus, typhoid, tuberculosis, etc. It is very common in infants suffering from harding or any other deformity of the mouth. The disease is frequently seen in foundling asylums, in all places where many young infants are crossed together, and where cleanliness of mouths, bottles, etc., in neglected.

Lexions.—The spores lodge between the epithelial cells and gradually separate the different layers. This occurs before the formation of the white pelliele. Later the disease spreads on the surface of the mucous membrane, and also penetrates the deeper structures. It may invade the blood-vessels and cause thrombosis or even be carried to distant parts. Although the saccharomyces albicans is commonly found upon that epithelium, its growth is not confined to it. It usually begins at many distinct points upon the nurcous membrane, and gradually spreads until coalescence takes place; a continuous membrane may be thus formal. No put is produced by the process.

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The usual seat is the margin of the tongue, the inside of the lips and cheeks, and the hard pulate, but not infrequently it involves the pillars of the fauces, and the entire pharynx. Further extension in the digestive tract than this is rare, although the exoplugus, the stemmels, and even the intestines, may be invaded. We have seen it but once or twice in the exoplugus and tower in the stomach, and we know of but two reported cases in this country in which thrush has been found there. Cases involving the cooplague and the stomach appear from reports to be much more common in Europe. In a few cases in the Rabies' Hospital the succharomyces allicans has been found in the lungs of infants suffering from homehopucumonia. There are several reported cases of general blood infection from this organism.

Symptoms.—The essential symptoms of thrush are the appearance upon the muceus membrane of the mouth—usually beginning upon the tongue or the inner surface of the clock—of small white flakes which resemble deposits of congulated milk, but which differ from them in the fart that they can not be wiped off. If forcibly removed, they usually tower a number of bleeding points. There may be only a few scattered patches, or the mouth and plurynx may be covered. The mouth is generally dry and the tongue coated; food may be refused on account of pain, and there may be some difficulty in swallowing. The other symptoms depend upon the conditions with which the thrush is associated.

Diagnosis.—This is rarely difficult. The deposit may be mistaken for congulated milk, but is distinguished by the features just mentioned. When existing upon the pharynx and fences it has been confounded with diphtheria, although this mistake can hardly be made if all the facts of the case are taken into consideration—the age of the patient, the involvement of the lips and tongue, the dry month, the absence of gland-niar enlargement, etc. In any case of shocht the examination of the deposit under the microscope at once precals its true nature.

Progrests.—Thrush is not in itself a dangerous disease, except in the very rare instances where it may obstruct the exoplague, and this can hardly secur except in a condition of exhaustion which is necessarily fatal. In a feeble and delicate infant, or in one with barelip or cleft palate, thrush may be a serious complication. With proper treatment most of the cases involving only the mouth are readily cured.

Treatment.—Thrush may usually be prevented by due attention to cleanliness of the mouth, rubber nipples, bettles, cloths, etc. In infants with deformities of the mouth in institutions, it frequently decelops despite all precautions. All rubber nipples absuld be kept in a solution of boric acid and the shill's menth should be cleaned several times a day. On no account should a feeding-bottle be passed from one shill to another.

In the treatment of the disease the essential things are cleanliness, and the use of some mild antiseptic mouth-wash. The best routine treatment is to cleanse the mouth carefully after every feeding or transing with a solution of birarbenate of sods, and to apply twice a day a cosper-cent solution of formalin. All applications should be carefully made, so as not to injure the epithelium. The best method of cleansing is by a small swab made with a wooden toothpack and absorbent cotton. Applications to be especially avoided are those mixed with honey or any syrap. In hospital cases the disease seems to be prolonged by the irritation of the rabber nipple of the feeding-bottle. In such it has been our practice to feed by gavage for two or three days, as some cases improved much more rapidly when this was done.

CONORRHEAL STOMATITIS

There has been described by Dohm and Resinki a form of stomatitis in the newly born, due to a generiheal infection. This is not likely to take place unless the epithelium has been removed. The infection in all cases occurred from the mother. The lesson consists in the formation of yellowish-white patches upon the tongue or hard palate—regions in which the epithelium is liable to be injured by rough attempts at cleaning the mouth. There may be other evidences of generalization topscially ophthalmin. The diagnosis rests upon the discovery of the generactories in the exactate. In all the cases cited the general health was not affected, and recovery followed in the course of a week or ten days.

The treatment consists in thorough cleanliness and in the application of a saturated solution of boric acid or of formalin, as in thrush.

SYPHILITIC STOMATICS.

The buccal symptoms of hereditary syphilis are important both from a diagnostic and a therapeutic standpoint. The most frequent lesions are fasoures, ulcers, and nuccous patches. Pisoures are found upon the lips, most frequently at the angle of the mouth, and are usually multiple. They may be quite deep and cause frequent hemorrhages. Macous patches are superficial afters developing from papules which form upon the marcoas or mucocutaneous surfaces. In cases of acquired syphilis in children the primary sore may be seen upon the tongue, the lip, or the toneil. All these symptoms are more fully considered in the chapter on Syphilis.

DIPHTHEOTIC STOMATITIS

In severe cases of diphtheria the membrane is found not only upon the pharynx and torsils, but it may appear anywhere upon the buccal muccos membrane or the lips. It is questionable whether the diphtheritic process ever begins on the mucoes membrane of the mouth, or is ever limited to this part. In our own experience diphtheritic stomatitis has always been associated with deposits upon the torsils and pharynx. It is seen only in the severest cases, and in those which, from other conditions present, are almost necessarily fatal. Bearing in mind the above points, it can hardly be mistaken for any other variety of stomatitis, although not infrequently the mistake is made of regarding as diphtheritic, cases of herpetic stomatitis in which the ulcers have coalesced. The treatment, so far as the mouth is concerned, consists in cleanlines by frequent gargling or irrigation with a hot saline solution. Forcible removal of the membrane is not to be advised.

GANGRENOUS STOMATITIS-NOMA

(Cancrum oris)

The term nome is used to designate all forms of spontaneous gangrone occurring in children, which involve nucceus membranes or nuccentaneous crifices. The most frequent situation being the mouth, nome and gangrenous stomatitis are often used synonymously. Nome may, however, affect the nose, external auditory canal, vulue, propure, or axis. It is a rare discuss, and usually terminates fatally.

Etislogy.—Nome is seldem seen outside of institutions for children, where small epidemics are not uncommon. It is usually secondary to some of the infectious diseases, most frequently following member, and next to this scarlet fever, typhoid, or whooping-cough. While it may occur at any age, most of the cases are in children under five years, and in those of poor general condition. Nones seldem attacks parts previously healthy. In the mouth it may be preceded by catarrhal, or more often by observative stomatitis; in the auditory canal, by a chronic citits media. There seems little doubt that the disease is contagions. We made saw five cases in a single ward, all beginning in the auditory canal, which were apparently produced by the use of the same syringe to clean the cars without proper disinfection. All these children were suffering from whooping-cough at the time.

It is now quite well established that the exciting cause of norm is the

same as that of alcerative stematistis (q. v.). The pathological process in one case is of a mild type occurring in patients of considerable resistance. In the other it is of a severe or malignant type territing in patients of feeble resistance as a result of previous acute disease. In the gaugernous bisses pyogenic used and patrofactive bacteria are abundant. In the border cone, and extending into the adjacent boolthy tissue the specific organisms of the disease are usually found.

Lexions.—The process is one of slowly spreading gaugests. In most of the cases there are thrown out inflammatory products in quite large amount, but there is little or no tendency to limitation of the disease. This aroully advances steadily until death occurs. In a small number of cases a line of demorcation finally forms and the slough separates, leaving a large area to be partially filled in by granulation and cicalritation. Other infectious processes are likely to accompany the disease, particularly broacheptesimonia.

Symptoms.—The constitutional symptoms are not usually severs until the local disease has existed for several days. Then those of marked prostration and sepais develop, sometimes quite rapidly. The temperature is usually elevated to 100° or 100° F., and sometimes to 104° or 105° F. There is duliness, apathy, feeble pulse, unserther relaxation, and very often distribute. Before death the temperature may be subnormal.

Of the local symptoms, often the first to attract attention is the oder. of the breath; sometimes it is the dusky spot on the check or lip. On examination of the mouth, there usually is found upon the gum or inside of the check a dark, greenish-black recrutic mass, surrounded by tissues which are swollen and edematous, so that the clack or lips may be two or three times their normal thickness. Esternally the parts are tense and brawny from the swelling, this inflitration always extending for some distance beyond the gangrenous part. As the process extends, the tooth loosen and fall out; there may be necrosis of the alreolar process of the jaw and perforation of one or both cheeks or lower lip; extensive alonghing of the face may take place, usually upon one side, sometimes upon both, giving the patient a herrible appearance. In one patient the process began in the right check, subsequently involving the left; perforation occurred in both cheeks, and before death a large part of the face was gaugrenous. The odor from a severe case is very ofensive, and, in spote of all efforts at disinfection, it may fill the ward or even the house. Pain is rarely severe, and in many cases it is absent. Extensive hemorrhages are rare,

We have notes of seven cases in which norms affected the ear, being preceded by chronic otitis media in every instance. The disease began in the deeper structures of the canal, the first symptom noticed usually being a nodular swelling just beneath the sar, crowding the lobe upward. Shortly afterward there appeared the dirty brown discharge with a gangrenous oder. Later, the gangrenous circle surrounded the meatus, which gradually extended, until in some cases the whole side of the face and load were involved. A probe could readily be passed into the cramial cavity. All these cases ended fatally.

The usual duration of the disease is from five to fen days. If removery takes place, there is first seen a line of demarcation; then the slength is thrown off, and granulation and escatrization begin, but require a long time, usually leaving an unsightly deformity.

The prognosis is grave, fully three-fourths of the cases proving fatal.

The results depend not only upon the disease itself, but upon the con-

dition of the patient with which it is associated.

Gangrenous stomatitis can hardly be mistaken for any other form of disease scentring in the mouth, and early recognition is of great imper-

tance, since only early treatment is likely to be successful.

Treatment.-Much can be done to prevent the disease by careful attention to all the milder forms of stomatitis, particularly to the alcorative variety. Frequent and thorough elemning of the mouth in all acute infectious discusse is a part of the treatment which is too often neglected. This should be a matter of routine in every severe illness in a young shild. Recognizing the malignant nature of gangrenous stomatitis, its treatment should be radical from the very outset. Of the measures which have been proposed, that which seems to offer the best chance of arresting the process is excision with cantengation. This should be done under anesthesia. In excising, one should go some distance into tissues apparently healthy, for the reason that the process has always advanced further in the subcutaneous tosues than in the skin. The edges of the wound should then be thoroughly ensterized, best by the Pasuelin cantery. Of the other means employed, the use of strong carbolic acid immediately followed by alcohol is protably the best. This is to be used after excising or curefting the necrotic tissue. The mouth should be kept as clean as possible by the use of peroxid of hydrogen. The general treatment should be supporting and stimulating. As the possibility of contagion exists, every case should be isolated.

CHAPTER II

DISEASES OF THE PHARYNX

ACUTE PHARYNGIES

Acture pharyegitis may exist as a primary disease, or with any of the infectious diseases, particularly works fever, measles, diphtheria, or influence. Secondary pharyegitis will be considered in connection with these different diseases.

Certain children have a constitutional predisposition to attacks of acute pharyngitis, and contract it upon the slightest prescention. In some of them there is a strongly marked rheumatic diathesis. Attacks of acute pharyngitis often follow exposite. In many cases they are associated with acute disturbances of digestion. All of the above causes probably act by producing local and general conditions favorable to the development of microorganisms already present in the mouth. The harteria most frequently associated with severe attacks are the staphylococcus, the pneumococcus, the streptococcus, and less frequently, the influence bacilles.

In acute catarthal pharyngists the inflammation may involve the entire mucous membrane of the tonnils, fances, uvula, posterior and lateral pharyngeal walls, or any part of it. It may exist alone, or in connection with a similar inflammation in the rhinopharyns or in the laryax. In the beginning there is seen an acute redness, notally involving the entire pharyns. This may entirely subside after twenty-four hours, or it may be followed by the usual changes of neute extarrial inflammation dryness, ovelling, and edema. Later there is increased secretion of mucus, and finally there may be muco-pus. Occasionally slight hemorrhages are present.

There is pain at the angle of the jaws, which is increased by swallowing, also a sensation of dryness and roughness in the pluryux, and often an irritating sough. There may be slight swelling of the neighboring lymphatic glands. The constitutional symptoms in young children are often severe. Not infrequently there is a sudden coset with consting, and a rise of temperature to 192° or even 194° F. These symptoms are usually of short duration, frequently less than twenty-four bours, and in two or three days the patient may be estirely well. In other cases the pharyngitis may be accompanied or followed by laryngitis.

Acute primary pluryngitis is to be distinguished from scarlet fever, diphtheria, measles, and influenza. A positive diagnosis from scarlet fever is impossible until a sufficient time has slapsed for the emption to appear, and the patient should be closely scatched for the first sign of this. If scarlet fever is prevalent, a child with the symptoms of severe pharyngitis should at core be isolated while waiting for the diagnosis to be settled. There is commonly less deficulty in excluding measles because of the absence of Koplik's sign on the baccal mucous membrane, and of the accompanying catarrh of the eyes and nose. Catarrhal diphtheria can be excluded only by culture.

The first step in the treatment of sents pharyngitis is to open the towels freely by means of caloniel, castor oil, or magnesia. The child should be kept in bed, and the diet should be finid, or, in the case of infants, the amount of food should be much reduced. Pieces of ice may be swallowed frequently for the relief of pain and thirst. Internally there may be given two grains of phemoetin every four hours to a child of three years. It is important at the outset to induce free penspiration. The disease is not serious, and the indications are to make the child as comfortable as possible during the short attack.

UVULITIS

Acute inflammation of the uvala, with swelling and edema, occurs as a part of the lesion in acute pharyngitis. In rare instances the uvala may be the principal or the only seat of inflammation. Huber (New York) has reported two cases, one of which is unique. An infant ten months old was apparently well until two hours before he was seen, when there was neticed a constant irritating cough, accompanied by considerable gagging. Later there could be seen in the mouth a prominent red mass, the enlarged and slongated arcala. There were also purcayons of coughing, which interfered both with nursing and deglutition. The general symptoms were quite alarming. The avala was found to be fully one inch long and half an inch wide, red and edematons; in other respects the throat was normal. The symptoms were relieved by multiple needle punctures and the use of ice. In such conditions the greatest relief is often afforded by the application of epincphrin or its use as a spray or gargle.

ELONGATED UVULA

Probably this is primarily a congenital condition. It is increased by repeated attacks of acute or subneute inflammation. The degree of clongation varies in different cases; in some it may be an inch in length. Only the mucous membrane is involved in the clongation. The symptoms are those of local irritation, especially a cough upon lying down, and the sensation of a foreign body in the pharynx. In some cases it may be a reflex cause of arthma, or, more frequently, of catarrhal spann of the laryns. The diagnosis is very easily made by inspecting the throat. The treatment consists in grasping the tip of the uvula with forceps and outting off the excess with the acissors, or a uvulatome. Care should be taken not to cut off too much of the uvula, or severe hemorrhage may occur.

RETROPHARYNGEAL ABSCESS.

Two distinct varieties are seen: (4) The so-called idiopathic absences which belong to infancy, and (2) absences accordary to caries of the cervical vertebras.

Retropharyngeal Abscess of Infancy .- All of the later investigations regarding this disease indicate that primarily it is not a cellulitie, but a supporative inflammation of the lymph nodes (lymphatic glands) with a surrounding cellulitie. The retroplaryngual lymph nodes form a chain on either side of the median line between the pharyngeal and the prevertebral muscles. These nodes are said to undergo alrephy after the third year, and in some cases to disappear entirely. Retroplaryngeal abasess-or, more proposly, retropharysignal lymphadenotis, since the process does not invariably go on to supporation—is probably never primary, but secondary to infectious naturals of the pharyny, and is set up by the entrance of pyogenic bacteria, initially the staphylococcus or streplocecrus. Its pathology is the same as the more frequent supports tive inflammation of the external cerrical lymph nodes, with which it is sometimes associated. Usually only a single node is involved, but sometimes two or three are affected, and these may be situated upon opposite sales. We have frequently seen retropharyngeal lymphafenitis so severe as to give rise to marked local comptoms, although it did not go on to supporation. Kormann's observations, however, show that swelling of these glands in diseases of the mouth and throat is terr much more common than is generally supposed. Similar abscesses from suppurative inflammation of other lymph nodes in the neighborhood of the pharyny may occur. We have seen one situated between the spiglottis and the base of the tengue.

Etiology.—These cases almost invariably occur in infancy. Fully three-fourths of those that have come under our observation have been in patients under one year. Bokas (Buda-Pesth) reports that of sixty cases observed, forty-two occurred during the first year, eleven during the second year, and only seven at a later period. The primary disease in usually a severe thinopharyagitis, or an attack of epidemic catarris. but rarely it occurs as a sequel of scarlet fever or measles. In six hundred and sixty-four cases of scarlet fever, Bokai noted retropharyageal abscess in seven cases. After measles it is even more rare. Retropharyageal abscess negative secure in winder or spring, on account of the prevalence of the diseases upon which it depends. It is seen quite as frequently in children who were previously robust as in those who are belicate, but is more common in those who are prone to severe externial affections.

Symptoms.—The early symptoms in most cases are merely those of an ordinary rhinopluryugoal cutarrh. After this has subsided the temporature may remain slightly elevated, often for a week or more, before local symptoms are noticeable. Sometimes, without any distinct history of previous satarrh, there are seen quite high temperature, from 102° to 104" F., loss of flesh, and prestration. A careful examination may be required, and sometimes observations for a day or two, before the explanation of these constitutional symptoms is discovered. In other cases the early constitutional symptoms are so slight as to secupe notice, and the local symptoms are the only ones present. Although amaily these are not severe, retroplaryngral alocess may cause dyspora, which in a short time assumes an alarming character. The duration of the inflammatery process before abscess forms is generally live or six days, but it may be several weeks. The temperature is invariably elevated, usually from 100° to 103° F.; occasionally it may be 104° or 105° F., with symptoms of prostration seemingly out of all proportion to the local disease, but which are to be explained by the tender age and feeble resistance of the patient,

The most characteristic local symptoms are the posture, the head being drawn far backward to relieve pressure on the laryex, the near repiration with the mouth open, difficulty in degletition and some external swelling. Sometimes the first thing to attract notice is a sudden attack of dyspaca severe enough to cause asplicain. This is due to the pressure forward of the abscess encroaching upon the laryax. The mouth may be dry, or there may be a copious secretion of pharyageal mucus. The dysmes is in most cases greater on inspiration, and in some it is noticed only then, exponetion being normal. The difficulty in swallowing is greater when the tumor is law. The child may find it impossible to swallow, and in consequence may refuse to nurse; or the difficulty in nursing may depend upon the most obstruction. Sometimes there is regurgitation of food through the usee or mouth. The voice is usually natal. Generally there is no hourseness, but a peculiar short cry which is quite characteristic. There may be, although rarely, aphonia. Usually there is some swelling to be seen externally, just below the angle of the jaw in front of the eternomastoid muscle; exceptionally this may be more preminent than the internal swelling. Occasionally torticollis is

an early symptom.

On inspection of the threat there is seen a distinct bulging of the lateral wall of the pharyux, usually a little above the base of the tongue. The swelling may be so great as to crowd the usuals to one side and nearly ill the pharyux. It is rarely, if ever, in the median line. There is usually reduces of the mucous membrane and edema of the avala and of the adjacent parts. On digital examination the swelling is made out even better than by inspection. It may be situated as low down as not to be visible at all. In the early stage there may be felt only a localized induration or a somewhat diffuse swelling, but by the time the swelling is large enough to produce marked symptoms, fluctuation can generally be discovered.

Progressis.—When left to itself the abscess may open into the pharynx, the pus being swallowed or expectorated. The cavity may close rapidly by granulation, and in a few days the patient be entirely well; or the abscess may refill. External opening almost never takes place. It is rare for much harrowing to occur. In young or very delicate infants the constitutional symptoms may be so severe that the child continues to fail even after the exacuration of the abscess, and dies usually from brone-hopnesmannia.

Death may occur from asphyxia due to pressure upon the laryns, to edema of the glottis, or from rupture of the abscess into the air passages, especially if this occurs during sleep. Carmichael, Bokai, and others have reported deaths from inceration into the carotid artery, or one of its large branches. Carmichael's patient was only five weeks old. The general mertality is from five to ten per cent; many deaths are due to a failure to make the diagnosis. Gautier has collected ninetyfive cases, with forty-one deaths. In our experience death has most frequently resulted from late bronchopseumonis; in one case it was due to a secondary retro-coophageal abscess.

Dispusois.—Retropharyngeal aboves is to be suspected if in an infant there is difficulty in swallowing, noisy dyspens, mouth-breathing, and the head drawn backward. A positive diagnosis is possible only by a digital examination of the pharynx. The mistake most often made is, that the physician, called to a young child suffering from great dyspers, has jumped at a diagnosis of laryngeal stenosis, and forthwith performed tracksotomy or intulation, without taking the trouble to get the history or to make a careful examination of the pharynx. Many such cases are reported in which the child has died during the operation or immediately afterward, the sutopsy first revealing the nature of the disease. A sudden attack of dyspecs like that caused by the repture of an abscess might be produced by the lodgment of a foreign body in the pharynx or larynx. A digital examination would gid in the diagnosis. We once saw in an infant a sarcous of the pharyngeal lymph nodes which gave an external and internal lumor exactly like that of a retropharyngeal abscess.

Treatment.—Before the abscess has pointed, hat applications may be made to the throat to relieve the symptoms and to hasten the formation of pus, since resolution is not to be expected. Spontaneous opening should never be waited for, on account of the danger of the rapid development of serious symptoms from pressure or adems, or of suffocation from an opening into the air passages, especially during sleep.

As soon as the diagnosis is made the case should be carefully watched, and as soon as a point of superficial fluctuation is detected, but not before, the pur should be exacuated. External incision has been advocated, but the internal opening is much to be preferred. In opening through the mouth the patient should be stated in an apright position and the head firmly held. The use of a month-gag may cause asphysia. The sheess may be opened with a bistoury which has been guarded to its point by winding with rubber plaster, or letter with a pair of blunt pointed scissors or with an arriery clamp. Often a finger-nail sharpened to a point is all that is necessary. After opening it is well to insert the finger into the cavity to enlarge the opening and Ireak down any septa; for after a simple puncture the aboves may refill. The head should then be bent forward, to allow the pas to escape through the mouth. The amount of pus evacuated varies from one dram to half an ounce. In the majority of cases no after-treatment is required. The relief of the despues and dysplagia is immediate, and, except in young infants, recovery usually rapid. Occasionally there is so much edema that even after evacuation tracheotomy may be necessary.

Retropharyngeal Abscess from Pett's Disease.—This form is rure in comparison with that just described, and under three years of age it is extremely so. These abscesses are usually larger, and the amount of pus contained may be from four to eight ounces. They form very much more slowly, often lasting for months, and as with other accordary abscesses, the constitutional symptoms are achieve severe. The swelling is frequently in the median line, and is not so circumscribed as in the idiopathic cases. The pus often hurrows along the spine for several inches.

The symptoms of Pott's disease of the cervical region are usually present for several months before the appearance of the abscess. Sometimes the abscess procedes the deformity, and it may be the first intimation of the existence of bone disease. The local symptoms resemble those of the idiopathic cases, but they develop more slowly, and sudden attacks of fatal asphyxia are very rare. External swelling is usually seen, and it may be quite large, extending almost from one ear to the other, forming a distinct collar. On digital exploration there may be found an irregularity of the anterior surface of the corrical vertebras, and occasionally a marked angular prominence.

When left to themselves these abscesses may open externally in front of the sternomastoid muscle just helow the jaw, sometimes nearly as low as the clavicle; they may rupture internally into the pharyna, the cooplagus, or the air passages; or they may burrow a long distance in front of the spine. Death may result from pressure upon the laryna, or from rupture into the laryna, traches, or pleurs; all these, however, are rare. The abscesses not infrequently retill after they are evaruated, and occasionally a discharging sinus is left for many months.

Treatment.—These aboxeses should be opened or aspirated as soon as they are large enough to give rise to local symptoms. The external incising just in front of the sternomastoid muscle is generally to be preferred to opening through the mouth, since it gives better dramage, and the after-treatment is more easily carried on; and a sinus opening enternally is less objectionable than one opening into the pharyux.

ADENOED GROWTHS OF THE VAULT OF THE PHARYNX

This is a very common condition and one formerly much neglected by the general practitioner. It is the source of more discomfort and the origin of more minor ailments than almost any other pathological condition of shiblhood.

There is a mass of lymphood tissue situated at the vault of the pharynx which in structure closely resembles the tonsils. It is often speken of as the "pharyugeal tonsil." Like the funcial tonsils, this may become greatly hypertrophical, so as to form a tumor large enough to fill the rhinopharynx completely. Those tumors have a broad attachment which is sometimes more to the roof, and sometimes more to the posterior wall of the pharyux. The term adenced regulations was given to them by Meyer, who first described them in 1868. In infancy these growths are soft, vascular, and spongy; in older children they become firm, dense, and more filterus. Their appearance is well shown in Fig. 20. Adenoid regetations are associated with hypertrophy of the faucial tonsils in about one-third of the cases. Growths large enough to came decided usual obstruction may in time produce changes in the facial bones amounting to positive deformity. The bony pulate may be doneshaped or even neutrly arched; the dental arch of the upper jaw becomes almost V-shaped. Deformities of the thorax also secur, which will be described with the symptoms.

Rhislogy. Hereditary influences certainly play some part in the production of this condition. Frequently every one of a large family of children may be affected, and often the parents have suffered from the same condition. While infants are born with adenoid tissue in the masopharyne, it is in almost all instances small in amount and soldern increases markedly in size until after several months. What causes the



Pas. 22.—Assesses Vaccarations, Narround Stan. (I) From child eight months old; (2) from child twenty-two months old; (3) from child two and sur-half years old; (4) from child two and sur-half years old; (4) from child two seed car-half years old; (5) from child throu years old. With the exception of (5) all were removed with a single eweap of the curette. Although the growths represented are somewhat larger than the average for the ages mentioned, just such once we constantly suct with in practice.

abnormal development of this tissue it is hard to say. Adensid growths are most common in damp, changealds climates. Their first symptoms often follow an attack of measles, scarlet fever or diphtheria. The repeated attacks of rhimspharyngitis associated with adenoid growths are more often a result than a cause of the condition.

Carrny believes that the excessive growth of tissue in the rhinepharynx is in many instances the result of overleading. It is certainly true that adencial growths are much more common in well rourished than in peorly nearished shildren. Much interest has lately teen awakened regarding the relation of adencial growths to tuberculosis. Of 945 cases collected by Lewin in which specimens of adencials were examined, tuberculosis was present in five per cent. Though this proportion is no doubt much higher than will be found in private practice, the fact is an important one; for it is highly probable that this is the clumnel of infection in not a few cases of tuberculosis.

Symptoms.—The symptoms of adentid growths are usually first noticed when children are from nighteen months to three years old; but they may be present almost from birth. We have in several instances seen them to a marked degree in infants only a few months old. The symptems generally increase in severity as age advances, being always better in nummer and worse in winter, until the age of six or seven is reached. The chief symptoms are these which relate to (1) chronic thinopharyageal cutarrh. (2) mechanical obstruction, (3) otitis and other sural conditions. (4) general malnutrition and anemia, (5) reflex nervous phenomena.

The rhinopharyngeal catarrh shows itself by a pensistent usual discharge, or frequently recurring acute attacks of head-colds during the winter season. In susceptible children these attacks are often the beginning of a bronchitis, which may keep a young child indoors almost the

catire winter.

The obstructive symptoms are inability to blow the nose, monthbreathing constantly or only during sleep, and a name voice. The difficulty in breathing is increased when the child lies upon the back. In consequence of this, children sleep in all sorts of positions—lying upon the face, sometimes upon the bands and knees, and often toss restlessly about the crib in the vain endeavor to find some position in which respiration is easy. The attacks of dyspace at night may amount almost to asphyvia, and are the explanation of many of the so-called nightturness from which children suffer. When the obstruction has existed from infancy there are often determities of the chest; these are most marked in rachitic subjects. The most frequent one consists in deep lateral depressions of the lower part of the chest, with a prominence of the sternum. The deformity is due to interference with pulmanary expansion. There is often seen a flattening at the rost of the nose, and sometimes a prominence of the transverse vein in this region.

Some impairment of hearing exists in a large proportion of the cases. Blake (Boston) found this to be true in 39 out of 47 cases examined; in 35 of these marked improvement in the hearing followed removal of the adenced growths. Deafness may be due to takel externs of the edition. Often a history is given of several attacks of suppurative cliffs.

Many young children who are subject to attacks of spasmedic crosp bure admoid growths, the removal of which is frequently followed by the complete crossion of such attacks. Other respiratory symptoms associated with adenced growths are intractable cough without bronchial symptoms or signs, and persistent hourseness lasting for mouths, or even for years and recurring every cold season. These symptoms are the result of the chronic inflammation in the rhinopharynx, sometimes extending to the larynx, with an increased secretion of thick mucus. Both these conditions are often sured by the removal of the adensid growths after all other treatment has been without effect. Bronchial asthma seems at times to be dependent upon these growths.

The reflex symptoms ascribed to adenoid growths have been greatly engineered. Children become nervous if they have obstructive symptoms with disturbed sleep, or if they spend much of the time in had or in the house. Such children present a number of nervous manifestations that may be due to other factors producing nervousness, quite as much as to adenoid growths. Incontinence of urine is very rarely cared by the removal of such growths. Houlaches with them are, however, common. Stammering, charge and even epileptiteem sciences have been attributed to adenoid growths, but without sufficient justification.

The general health of patients suffering from adenoid growths may be impaired from less of sleep and from confinement to the honor necessitated by attacks of broughitis or rhinopharyngitis. Anessa is often present. In old cases of a severe character, children may have a dull and stupid facial expression. They are tanguid, listless, often depressed and this associated with deafness frequently causes them to be regarded in school as children who are somewhat deficient mentally.

These patients are always better in summer and worse in winter. The natural course of the growths if left to themselves is to increase up to a certain point, and then to remain stationary until pulsety, when they usually undergo some degree of atrophy. This, with the marked increase in the capacity of the rhinopharynx which occurs at this time, results in a disappearance of the most aggravated symptoms. The removal of the patient to an elevated region with a dry atmosphere will often result in a relief from all the symptoms, and a diministion in the size of the growth, but unless such a charge in resolutes is permanent the symptoms are liable to return. Under ordinary conditions there is little or no tendency to sportmeens recovery. In children with adenoid growths attacks of diphtheria, scarlet fever, measles, and whooping-couch are all likely to be more attacts.

Disgresis.—In a well-marked case the condition is usually evident from the history, and can scarcely be overlooked. The intractable nasal catarrh, upon which no treatment, local or general, has more than a temporary influence, the mouth-breathing, the disturbed sleep, and the slight deafness—all are characteristic. At other times the patients come for treatment on account of the general symptoms—the nervous depression, the hendaches, or the anemia. In rare cases the leading symptom may he epistaxis. The symptoms do not always depend upon the size of the growth, for in a small throat quite a small growth may cause very marked symptoms.

Although the history is in most case clear, only an examination can make us certain that an adenois growth exists. The growth is ordinarily felt as an irregular, granular, soft, velvely mass, or sometimes as a firm tumor completely blocking the passage; and the finger, when withdrawn, is frequently covered with block. By posterior rhinoscopy, the growth in older children can be seen.

Treatment—The disappearance of adecord growths is possible only when they are small. This is added by removal to a warm, dry climate for the winter season. All possible means should be employed to present these patients from taking cold. With the larger growths these methods may improve the entarrhal symptoms, but can hardly affect the obstructive ones. The reduction of turners of any considerable size by local applications is a delusion; every marked case that has come to our notice has been relieved only by operation.

Benoval of advaced growths is indicated: (1) When the obstructive symptoms—habitual mouth-breathing, disturbed sleep, usual voice, cheet deformation, etc.—are marked; (2) for a chronic usual discharge, constantly recurring attacks of rhimopharangitis, particularly when these tend to develop into broachitm or largingitis; (3) when there is asthmaair repeated attacks of catarrial spasm of the larging; (4) with deafness, chronic otitis, or repeated attacks of acute otitis. Although striking improvement is not infrequent, one should be cautious about promising too much from operation, especially as regards the nervous conditions; also in older children when there is deafness or asthma.

The perferable time for operation is the late spring or early summer, in order that during the warm months the uncous membranes may have an opportunity to regain their normal condition; however, operation may be done at any time except during attacks of acute catarris. Unless the symptoms are very marked, it is desirable to defer operation until a child is at least two years old.

Removal of advances by scraping with the finger nail is at best a very american method, and is not to be advised. Operation for the removal of adenoids is preferably done with general anesthesis. So many deaths from operations done under chloroform have now been reported, and so many narrow escapes have occurred that have not been reported, that chloroform anesthesis should be given up altogether. Deep anesthesis is not usually necessary, and if the semi-error position is assumed it increases the danger of the entrance of blood or portions of the growth into the larguex, which might cause nephysia. The operation should only be done by one skilled in its performance.

Hemorrhage is always abundant, and seems alarming to one who sees it for the first time, but it generally ceases in a few minutes. There is evidence that the administration of filteen or twenty grains of calcium factate during the twenty-four hours preceding the opera-tion materially lessens the felecting. A child should not pass from the physician's observation until all hemorrhage has stopped. He should be kept quiet, preferably in ted, for twenty-four hours; and in the house for five or six slays, unless the weather is warm. No aftertreatment is necessary. Recurrences are occasionally seen even after a thorough operation by an experienced surgeon; but many of them are due to the fact that the primary operation was incomplete. The improvement generally begins in a few data, sometimes at once, though the full benefit may not be seen for a mouth. The breathing becomes from the eleep more quot; the month may soon be habitually closed; voice and hearing improve, and the benefit to the general health is soon apparent. The paller, listlesoness, and inattention disappear, and a rapid increase in weight often follows. The entire appearance of the child may in a few months be transformed.

Dangers and Accidents from Operation .- While it is rare that any accidents of a serious nature are met with, it should not be forgetten that they may occur. Undue laceration of the parts may result from a hungling operation, particularly with too large curettes or with the forceps. Hemorrhage may be excessive or even futal. We have seen but one case of fatal hemorrhaps, this in a blosder, and but two other instances of serious benterringe. A fatal result is exceedingly rare, Hemorrhage may be continuous after operation, or secondary, in which case it almost invariably occurs within twenty-four hours. It is important, therefore, that the patient be kept under observation for that time. Bleeding is best controlled by injecting into the rhimspharynx through the nostrals one or two drams of hydrogen personic, full strength, or, this failing, a solution of spinsplarin (1-1000) must be used in the same manner. If this is not effective, plugging of the thinopharyax and posterior rares may be resorted to. In all cases the patient should be kept absolutely quiet.

Occasionally an acute attack of broachitis or ofitis occurs after operation; and in a few recorded instances scute meningitis has followed. The danger of asphyxia from the entrance of blood or the tumor into the laryex has already been mentioned.

The danger from chloroform anosthesia is due not so much to the nature of the operation as to the condition of the patient. It is now well established that all children in whom the condition known as status lymphaticus is present, bear chloroform very budly.

CHAPTER III

DISEASES OF THE TONSILS

This topols are lymphost structures closely resembling Peyer's patches, but, instead of having a flattened surface, the lymphoid tissue in the topols is folded upon itself, forming quite deep depressions—the tensiliar crypts. These crypts, like the surface of the topols, are lined by epithelial cells. They contain lymphoid cells, desquaranted spithelium, particles of final, and factoria. Under normal conditions the topols take no part in absorption from the mouth. When, however, their epithelium is discussed or removed, the topols absorb with very great facility every sort of poson which the anouth may contain.

The most important chronic infection which takes place through the tonsils is that of tulorculosis; the most important acute or subacute infection is protabily that of progenic organisms. Poisons absorbed by the tonsils are taken up by the lymphatic ressels and through them reach the cervical lymph nodes and finally may be carried into the general circulation.

Acute inflammation of the tomils, like that of the pharynx, occurs regularly in diphtheria, scarlet fever, and measles, less frequently in the other infectious diseases. The secondary forms will be considered with the diseases with which they are associated.

Acute catarrial too-illitis, or inflammation of the mucous membrane covering the ton-ile, accurs so part of the lesion in acute pharyngitis, but very rurely is seen alone.

MEMBRANOUS TONSILLIPIS

(Pseudodyktheria; Streptoroccus Ausius; Croupous Tomillitis; Septie Sert Throat)

This occurs both as a primary inflammation and accordary to the acute infectious diseases, especially scatlet fever and measles. The angma of searlet fever is ossentially a part of that disease and is more fully considered in connection with it.

Etiology.—As was first shown by Prodden in 1888, and abundantly condermed by others since that time, this inflammation is usually due to the streptococcus; it may be found above, or associated with the staphylococcus surers, and occasionally the staphylo-occus may be found alone.

The streptseverus is very frequently found in the throats of healthy

children, particularly in winter and in cities, and more often in those who live in tenements or who are immates of hospitals or other institutions. The local conditions in the mucous membranes during an attack of measles, scarlet fever, and other infectious discuses, are especially favorable for the development of these germs, which at such times are very often present in great numbers even when no membrane is seen. There are seen occasionally, especially in cities, epidomics of great severity in which many persons, adults as well as children, but the latter chiefly, are attacked. Such epidemics have in recent years broken out in Boston, Chicago and Baltimore. Several of these have been carefully studied epidemiologically and have been traced to the milk supply. The milk has been infected from one or more cown suffering from septic infection of the adder. The organism has been found to be a hemolytic streptococcus with rather distinct cultural characteristics.

In the presence of an epidemic of severe tonsillitis, the milk supply should always be suspected.

Lexions.—In the primary cases the membrane is generally confined to the tensils or is chiefly there, only small deposits appearing elsewhere. In the secondary cases, the entire pharynx may be covered and the disease may extend to the nose, the mouth, the middle ear, and mirely to the larynx, traches, and brought.

The structure of the membrane resembles that of true diphtherin, and it may be impossible by a microscopical examination to separate the two diseases.

In the mild cases the inflammation of the mucous membrane is a superficial one and the pseudomembrane is not very adherent. In the severe cases, chiefly the secondary ones, the process extends much deeper. Besides the pseudomembrane upon the surface, there is intense congestion, edema, and cell-infiltration of all the lymphoid and cellular tissue of the pharynx. It may involve the tensils, soft palate, uvula, epiglottis, adenoid tissue of the stault and the entire pharyngeal ring, and also extend to the external lymph nodes and surrounding cellular tissue. The process both in the threat and externally in the neck may terminate in resolution, suppuration, or in necrosis. In severe cases, especially in the spidemic form, there are found the lesions of general septicemia or pyemia. There may be personities, endocarditis, perscarditis, meningitis, arthritis and erysipelas.

The streptococci are found in the false membrane, in the underlying macous membrane, in the lymph spaces, in the lymph nodes, and in the visceral lesions.

Symptoms. 1. The Princey Cases. The count is usually abrupt, with well-marked symptoms: there are frequently chilly sensations, head-ache, vomiting, general pains, and in most cases the child complains of

soreness of the threat and paim on steallowing. There are first seen a general resiness and swelling of the tensils, sometimes of the entire pharyax; shortly afterward membraness patches appear upon the tensils. These cary greatly in appearance. In color they are yellow or gray, often changing later to a dirty often int. The membrane seems toosely attached and can frequently be wiped off with a swab. It is often irregular in its outline, which is not sharply defined. The membrane usually remains but three or four days and disappears rapidly. As a rule, it is limited to the tousils, and does not spread after it first forms. Occasionally, however, small patches are also seen upon the fances or the pharput. The constitutional symptoms are generally severe during the first two days, and the temperature may be 103° or 104° E, but by the third day it falls, and most of the symptoms subside. It is rare for the docume to extend either to the ness or the largue.

The epidemic cases are usually more severe and the course prolonged. After the first few days, the throat symptoms may nearly disappear, but the fever continues at times for many weeks. The enlargement of the certical glands is a striking feature, especially of those cases that receiver, and this enlargement may persist for a considerable time after the establishment of convulences. Suppuration of the glands is infrequent. Eruptions are quote common. They may be small, punctate and hemorrhagic or crythematous. If of the latter type, they may be maid or intense, at times closely simulating searlet force.

The tendency to complications is great. One of the most common is perfonitis, which is almost uniformly fatal. Endocarditis and pericarditis are frequently seen. There may be septic arthritis, erysipelar or localized abscesses. Othis media is often associated. Death may be due to the complications or to the appticemia. It is a very severe form of disease. Except in the epidemic cases, the complications and sequelar are infrequent.

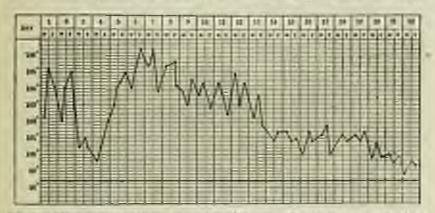
 The Secondary Cuses.—Some of these are mild, but the majority are severe. The clinical picture of the latter is that of scarlatina anginear, as given by the older writers.

In measles the throat symptoms are consewhat later than in scarlet fever; they may begin at the height of the primary fever, and increase while the emption fades. The process is almost invariably complicated by brouchopneumonia.

Secondary cases as a class are characterized by high temperature (Fig. 30), rapid, feeble pulse, great prostration, delirium, apathy or stuper, and often altermineria. In fatal cases death usually occurs at the height of the disease, from asthenia, teenchopasumonia, or asploritia. If none of these complications develop, patients may withstard the tools symptoms even when they are very severa.

There may be in connection with the local process in the threat, deep sleughing of the tonsils or adjacent structures, supportation of the lymphatic glands or in the cellular tissue of the neck, occasionally followed by sersons hemorrhage. However, these complications are rare, and if the patient survives the danger of the arute stage of the disease, he usually recovers.

Diagnosis.—The clinical features which distinguish membraness tonsillitis from diphthema are considered under the latter disease. It is



Pinc 20.—Semiprococcors Assupes, realization Minaster. The chart begins at the time of the full eraption is a severe case of mession. On the third stay the temperature full, with facing supption, and child second exaculations. With measuring the intemperature, the tensite, which before had been only red, showed membraness patched, the exalistion reposity spreading intil the realize phayax mus recorded, threat symptoms very severy, with great swelling of certiful glands, but the membranes that not extend beyond the pluryux. From sixth to worlds day a most prefound septiments, so that the was despaired of. The patient was a vincous shift, and, exacting both nephrilis and parameters rands a good recovery. Convolvence quite rapid; no secucion. Repeated cultures were made from the throat, but all showed only streptomest. Patient a girl loss years old. Case observed in private practice.

impossible in any case to be certain of the diagnosis except by cultures; for, although by clinical symptoms alone one may in the great majority of cases be certain that a given case is one of true diphtherin, to say that any membranous inflammation of the threat is not diphtheria is impossible.

A membrane which appears in the threat early in the course of measles or scarlet fever, or at the beight of the primary disease, is mually due to the streptococcus; while one which develops tate or after the primary fever has subsided, is frequently due to the diplotheria bacillus. When an eruption is present the diagnosis from courlet fever may be very difficult, at times well nigh impossible.

Prognosis.—In a child previously healthy, primary membranous tensillitis, except the epidemic form, is not a serious discuse. In the secordary cases, we find very different conditions. From the best available statistics it would appear that the usual mortality, when it is secondary to scarlet fever and measles, is from fifteen to twenty per cent. However, when these diseases prevail epidemically in institutions, the mortality is often higher than this.

Treatment.—Every shald with a membraneus patch on the torails requires close watching; strict quarantine should be enforced until the diagnosis is positively settled, and even if it is not diphtheria, close contact with other people should be prevented. If under three years old, unless the case can be seen frequently, diphtheria antitoxin should be administered, pending the result of a bacteriological examination. The primary cases require only the treatment of an attack of torsilling.

In the severe secondary and septic cases the nose and plarynx should be springed with a warm saline solution every two hours by day and every four bours by night. Where the swelling and edema are great, benefit may result from frequent spraying with solutions containing spin-sphras, also from inhaling hot super imprograted with escalliptol, benefit near external application, whenever there is great admitts and cellulities, nothing is so beneficial as the ice-lang.

The general management of these cases as to feeding, stimulants, etc., is the same as in diphtheria. Aside from stimulants no internal medication should be attempted with young children. Those who are older may take with advantage fr. ferri chlor., gtt. v to x, with glycerin. every three or four hours. All milk should be holled when there is an ontbreak of several cases of severe torsillitis in a community or family.

ULCEROMEMBRANOUS TONSILLITIS

(Pindent's August)

This is an inflammation conserbat resembling croupous tonsillities, but it is often unilateral and associated with superficial ulceration. The toned is covered with a dirty pellowish exudation, which may be mistaken for diphtheria. There is superficial necrosis, and when this tissue we wiped away with a swab, bleeding occurs. The disease is further distinguished by the swotten lymph nodes at the angle of the jaw, and by the fact that the constitutional symptoms which accompany other forms of tonsillitis are either very slight or absent altogether. The ethology is similar to, if not identical with that of ulterative stomatitis, with which it is sometimes associated. At such times the breath is foul and there is often profisse salivation.

Ulceromembranous tomillitis was first described by Vincent, and

by him attributed to a fusiform bacillus which he described; although a spirillum was found associated with it. Vincent's observations have been confirmed, and it has been shown that the spirillum is a degenerative form of the bacillus.³

The chief interest in alcoromembranous tensillitis lies in the diagnesis, although it is not an infrequent disease. It is to be treated, like ulcerative stomatitis, by the internal administration of chlorate of potash, combined with the local application of some antiseptic, such as peroxid of hydrogen or a ten-per-cent solution of nitrate of silver.

FOLLICULAR TONSILLITIS

This is the most frequent and most characteristic form of inflammation of the tensil. It is essentially an inflammation of the tonsillar crypts, and secondarily of the whole glandular structure.

Etiology.—There is seen in certain children a predisposition to attacks of tonsillitis, so that from very slight exciting cames these occursometimes from exposure, sometimes possibly from decangement of the stemach, and sometimes without any evident reason. Children with a rheumatic inheritance appear to be more enceptible than others. One attack predisposes to a second. Patients suffering from chronic hypertrophy of the tonsils are exceedingly prone to acute tonsillitis. It is not very common in infancy, but after this period it is very frequent throughout childhood. The disease, in all probability, begins as an infectious infanmation at the bottom of the crypts, due to the presence of streptococci or staphylococci, which readily enter from the mouth, and excite an attack whenever favorable conditions are present.

Lexions.—As a result of the inflammation, the tonsillar crypts are filled with epithelial cells, pus cells, muons, and hacteria. These form masses which appear at the mouth of the crypts as small yellow dots, often miscalled ulcers. Sometimes, in addition, filein is poured out, and forms, with the other inflammatory products, little plugs which project somewhat from the surface of the muons membrane, and which can easily be pressed out. Accompanying the changes in the muons membrane above mentioned, there are acute congestion and swelling of the whole tonsils, with more or less proliferation of the lymphoid tissue.

^{&#}x27;Vincent's bacillus is about twice as long as the Klebs-Leeffer busillus. It is thin, with pointed ends, and sometimes bent; it is negative to Grain's stain. The haddens bacillus is occasionally found alone; the spirillum, sever alone. The busillus is found in success from the affected tomal, in making which it is reconneeded to go deeply into the necrotic tissue, since the superficial parts are crowded with other bacteria. It is grown with difficulty and only upon special culture media.

Follocular tensilities is almost always bilateral. Although the pathological process is generally limited to the tonsile, there may be more or

less pharyngitis associated.

Symptoms.—The general symptoms usually appear before the local ones, and are often quite severs. The onest is abrupt with chilly sensations, occasionally a distinct rigor. In infants there is aften venuting, and sometimes duardies. There is pain in the back, in the numeles of the extremation, and in the band. Sometimes there is pain in the lateral servical muscles. The temperature rises rapidly to 102° or 103° F, often it tambes 104° or 105° F.

The first local symptoms are some arcelling of the tunnis and the appearance upon them of isolated sellow spots a little larger than a pin's bend. Often these can be wiped off with a such, or the little plugs can be squeezed out, leaving slight depressions. Later there is nexte congistion of the tensil, with more swelling. Even when the disease is at its height the local pain and discounfort may be only moderate, and in many cases scarcely noticeable. The swelling and tendernoss of the lymph glands behind the angle of the jaw are not great, and may be absent.

The constitutional symptoms, as a rule, but three days, and are must server upon the first day. The local symptoms last somewhat longer, but usually by the end of the fourth day the existate has disappeared, although enlargement of the bound may person for a week or even longer. On account of the connection of ton-illitis with risemantism, the heart should be watched during attacks, especially in these who are subject to them,

Diagnosis.—Tonsillitis may be confounded at its onset with scatter fever. The great frequency of tensillitis makes inspection of the throat imperative in every case of acute illness in children. The diagnosis from diphtheria is comidered in connection with that disease.

Treatment.—Follicular toroillitis is a mild disease without danger to life, and one which runs a abort, self-limited course. The indications are, therefore, to make the patient as comfortable as possible by the relief of individual symptoms. Other children, particularly those who are rheumatic, should be treated with sodium salicylate, or aspirm, four or five grains every three hours being given for the first twenty-four hours, and later less frequently. To infants these drugs must be given in smaller doses and with care, lest they upset the atomach. The general muscular pains of the first day are lest relieved by phemacetin, two grains every four hours to a child three years old. Later it may be used in smaller doses, but enough should be given to make the patient comfortable.

Local treatment is better omitted with infants. Older children may gargle with a solution of boric acid or may use a spray of Dobell's solution. Benefit often follows painting the tomils with tincture of iodin or a ten-per-cent solution of silver mitrate. In all doubtful cases the patient should be isolated and the same general treatment adopted as in diphtheria.

PHLEGMONOUS TONSILLITIS PERITONSILLAR ABSCESS-QUINST

This is an inflammation of the cellular tissue surrounding the tensil, sometimes invading the tensil itself. It may terminate in resolution, but usually goes on to the formation of an abscess. Phlegmanous tonsillitis is much less common in children than in adults, and, compared with the other forms, it is a rare disease in early life. It is the only variety which is regularly unilateral. In most cases the inflammatory process is circumscribed, but in rare instances there is seen a diffuse phlegmanous inflammation of the pharyny.

In certain patients there exists a constitutional predisposition to the disease, which may be associated with rheumatism. The exciting cause may be exposure, or anything which may reduce the patient's general health, to which there is added local infection. Catarrial pharyngitis predisposes to this disease.

Symptoms.—The sensel resembles that of following tonsillitis, the temperature is often high, and the muscular pains and prostration severe. There is acute pain in the throat, which is increased by deglicition, and finally may be so great that swalltoring is almost impossible. It is difficult to open the mouth. There is pain in the lateral muscles of the neck, and often tenderness. In the beginning but little can be seen on inspection, even though the patient complains of a very sore throat. This is always a suspicious circumstance, and should lead one to look out for quinsy. It is due to the fact that the inflammation begins in the deeper tissues, and that the mucous membrane is affected later. After twentyfour or forty-eight hours there is usually quite marked swelling, which is rather more behind the tonsil than elsewhere, pushing it upward and forward; sometimes it is more in front of the tonsil. A little later there is intense inflammation of the muccus manifemes covering the toroil, fauces, and urala, and not infrequently a fibrinous exudate; the urula may be pushed to one side, and the isthmus of the fauxes diminished to hardy one-half its natural size. In one of our own cases marked torticollis was present, and existed for two or three days before the diagnosis of quincy could be made by the offer symptoms.

In most cases the recognition of quinsy is quite easy by attention to the symptoms above mentioned. By inspection of the throat less information is sometimes obtained than by pulpation; by this means a fulness, and later a point of fluctuation, can readily be made out. Acuts philogenomous tousillitis generally involves no danger to life. In very young infants serious results may follow spontaneous rupture during sleep; and in older children occasionally there may be edema of the glottis. If not treated, abscess usually forms in from five to seven days, and orens spontaneously.

Treatment,—Many drugs have been advocated, but to our minds the best is saled, which should be given in doses of two grains every two hours to a child of five years. In some patients larger doses may be used. This may be combined with small doses (gr. %) of Boser's pewder. Relief may be afferded by very hot or cold applications, according to the sensations of the patient. The holding of ice in the mouth and the application of an ice-bag externally, often give great comfort. In other cases, gargling with very hot water and the application of hot flaxwed positions externally, will be preferred. As soon as fluctuation is detected an incision should be made with a guarded bistoury. If music too early, only a small amount of pas is evacuated and the aboves may retill. After spontaneous rupture the relief to symptoms is usually immediate.

CHRONIC HYPERTROPHY OF THE TONSILS-CHRONIC TONSILLITIS

The condition known as chronic hypertrophy is a permanent enlargement due to a proliferation of the lymphoid tissue of the tennils, and an increase in the connective-tissue stroma. If the increase in the connective tissue is slight, the tonsil is soft; if it is great, the tonsil is firm and hard, almost like a fibrous tumor. All degrees are found. Associated with hypertrophy of the tonsils there are usually found adensil growths of the pharyux, both of these depending upon similar local and constitutional conditions. There is in nearly all marked cases a chronic pharyugeal catarrh which may involve the Eustachian tubes.

Etislegy.—Hypertrophy of the tonsels is an exceedingly common condition in the cities of the seacoast and lake districts of the temperate zone. In a routine examination of 2,000 New York school children, Chappell found enlargement of the tonsils sufficiently marked in 270 cases to be considered pathological. The causes are constitutional and local. The condition frequently exists in certain families for several generations. It occurs in children who are in other respects healthy. According to Caerny, overfeeding may produce tonsillar enlargement just as it does enlargement of the adenoid tissue of the rhinopharynt. The most important of the local causes are attacks of acute or subscute pharyngitis. While it is true that attacks of acute inflammation are

often the cause of hypertrophy, it is also true that hypertrophy is one of the most frequent predisposing causes of scute attacks, and that it may be seen in children who have never had acute tousilitis.

Symptoms. Hypertrophy of the tonsils is rarely marked enough to cause any decided symptoms before the end of the second year, although occasionally in younger children enlargement sufficient to bring the two torsils into contact may be seen. The most important local symptoms. formerly ascribed to hypertrophied tonsels, are now known to depend upon adenoid growths of the pluryus. As these conditions are so frequently associated, it is somewhat difficult to determine which symptoms are due to the toroils alone. In a marked once, the most prominent sampletus are mouth-breathing, disturbed alcep accompanied by enering. and resal voice—the patient in some cases talking as though he had food in his mouth. There may be some deficulty in avallewing solid. fool. Enlarged tonsils may often be felt externally. As a consequence of the obstruction of the Enstachman intes there may be deafness. Deformities of the chest, such as pigeon-breast, are occasionally seen, but probably depend more upon obstructed respiration to adenoids than by the tonsils.

There are seen in certain children tonsils which show only a very moderate amount of enlargement, but are of unhealthy appearance and are accompanied by low fever and other indefinite symptoms of illness which may persist for months. The tensils appear to act in such cases as the avenue of absorption which results in a general infection.

The soft tonsile may diminish somewhat in one spentaneously. They sometimes shrink very decidedly after an attack of acute tensilities, searlet fever, or diphtheria. As a rule the tonsile become firmer and harder as time passes. They usually increase in size up to a certain point, and then remain nearly stationary until about puberty, when they may diminish considerably. During intercurrent attacks of inflammation, the swelling is much increased, and the symptoms are proportionately aggravated. In cases of marked enlargement very little spontaneous improvement is to be looked for during childhood.

Treatment.—Very large tonsils are a source of continued danger to the patient, and in every case of marked hypertrophy treatment should be advised. The danger may be from Eustachian cutarrb and desfaces, or from repeated attacks of acute tonsillitis. But quite as important as these is the fact that they increase the liability to contract diphtheria, and add to the dangers both from diphtheria and scarlet fever. If the patient is removed from the locality in which acute tonsillitis is liable to sever, to a dry climate, considerable improvement is leady to result in a young child in whom the tensils are soft, but not much is to be expected in older children with hard, fibrous tensils, except, perhaps, a rure of the accompanying pharyageal catarrh.

No internal remody offers much chance of benefit. Astringent applications may accompass something in recent, but practically assleing in old cases. In every murked case, operation is the only thing which can be relied upon to effect a care. For convenience of consideration, the cases may be divided into four groups; (1) Those in which the tonsils are nearly or quite in contact; (2) those in which they project only slightly beyond the faurial pillars; (3) those in which the torsile. although large, are deeply imhedded; (4) diseased tonsils, though above ing only moderate enlargement, especially when associated with tehenculens glands of the neck. All of the first group should unquestionable be counted upon, unless the putient's general condition is such as to forbid operation of any kind. In the second group operation is not indicated unless there are repeated armse attacks of inflammation. Whether an operation is done in the third group will depend upon the individual case. If there are frequent attacks of some tonsillitis or evidence of involvement of the ears operation should be performed. In the fourth group operation is indicated if general symptoms are present.

Of the various operations proposed for the removal of hypertrophied tonsils complete enucleation is clearly to be preferred. It is a painful operation, some preliminary dissection is usually required, and hence general anesthesia is necessary. The risk of serious hemorrhage in children is slight, but preparations should always be made to control it as even with non-bleeders one can never tell how severe it may be. Enlargement of the tonsil subsequent to simple amputation is quite frequently seen, especially if the patient operated on is under two years old.

We have more than once seen physicians greatly alarmed at the gray examd on the day following tonsillotomy, the appearance being such as to lead in several cases to the diagnosis of diphtheria. It is seldom that any but good results follow the operation of tonsillotomy if properly performed. When adenoids of the pharyex are also present, the symptoms may depend more upon them than upon the enlarged tonsils, and little benefit is seen unless the adenoids also are removed.

CHAPTER IV

DISEASES OF THE ESOPHAGUS

MALFORMATIONS

CONGENTIAL anomalies of the scoplagus are often associated with those of the lower part of the respiratory tract.

There may be, (1) Congenital fistula of the neck, due to a want of clasure between the second and third branchial arches. This gives an external opening just above and to the outside of the sternoclavicular articulation, which communicates with the upper part of the cooplague or the lower part of the pharynx. (2) The cooplague may be absent, the pharynx ending in a blind pouch. (3) The cooplague may be obliterated in certain portions, being represented only by a forces cord. (4) There may be stenois and dilatation or diverticula. (5) There may be fistulous communication with the trackes, existing either alone or associated with some of the other deformities mentioned. This is the variety which we have most frequently met with. From above, the cooplague neally terminates in a blind pouch. From below, it communicates with the trackes a short distance below the largue. The two parts of the anoplague are usually connected by a fibrous cord.

Congenital narrowing of the cooplingus and fistula of the neck are amenable to surgical freatment. The cases of complete obstruction in the exceptingus are almost of necessity fatal, the patients dying from inanition four or five days after birth.

The symptoms of couplingeal obstruction are regargitation on attempts at swallowing and the impossibility of passing the storagh tube. An X-ray picture after the administration of bismuth often gives valuable information.

ACUTE ESOPHAGITIS

It is quite remarkable, considering the frequency of pathological processes in the pharynx, that these so rarely extend to the couplingue. Thrush, when very extensive in the pharynx, may involve the upper part of the esophagus; but there it gives rise to no new symptoms. Dipittheria of the plarynx may invade the esophagus, but this is seen only in rare instances. Diphtheria of the esophagus produces no symptoms by which it can be diagnosticated during life.

Catarrhal Esophagitis.—Catarrhal coophagitis is very rarely met

with. It may be caused by lacerations due to swallewing a fereign body which may excite a simple contribut inflammation, or, if the foreign body is charp and angular, lacerations may be produced which result in alterations of variable depth. The close symptoms of catarrial couplingits are secretees and pain on swallowing. These becorations, when slight, are healed in a few days, and are rarely followed by any after-effects.

Carrosive Esophagitis.—This is altogether the most frequent form, and the only one which is of clinical importance. The usual causes are the same as of correcte gastratis, viz., the smallowing of caustic alkalis or strong acids. It is often in the coophagus that the most extensive injury is ilone. The offects are superficial or deep, according to the amount of the irritant awaltowed and its degree of concentration. There may be simply a destruction of the epithelial layer, which is followed by no serious consequences, or the museus membrane may be destroyed and the submucous cost invaded; surely, however, does the injury extent is the museular layer. If the patient survives the dangers incident to the scrittant possessing and the acute inflammation which follows, bealing by granulation and cicatrimation takes place, the confunction of the cicatrix gradually narrowing the lumen of the esophagus until stricture is produced.

The early symptoms of corresive couplingitis are mingled with those of inflammation of the mouth, pharyux, and stomach. There is a huming pain in the parts, great thirst, and spasm of the cooplagus on attempts at swallowing. There follows a period of acute inflammation of several days' duration, with great dysphagia and pain, in which the principal danger is colemn of the glottis. After this the patient may be comparatively well until the symptoms of structure begin, usually in from three to six mouths after the injury.

The indications for treatment in the early stages are, to neutralize the caustic in order to prevent if possible its deep action, to give rela, denuicent drinks and ice for the local effect, and morphic for the pair.

The treatment of coophageal stricture is purely surgical.

RETRO-ESOPHAGEAL ABSCESS

Acute retro-esophageal abscess occurs in infancy, though very rately, the pathology being the same as in scate retro-planyageal shores, the difference being morely one of location. A striking case of this kind occurred in the New York Foundling Hospital. An infant six months old was admitted with no loss of voice but with high fover (104° E.) and severe dyspace which were the prominent symptoms until death occurred four days later. There was a brococytosis of 100,000. At autopsy an aboves was found containing about three ourses of pas between the esophagus and the spine, extending from the laryax to below the bifurcation of the trackes. Shortly afterward a very semilar case occurred at the Babees' Hospital, following a retro-pharyageal abscess which had been opened two weeks before. Similar abscesses have also been observed after acute pharyagitis with the acute infectious discuss.

Retro-cooplageal adenitis, or culargement of the lymph nodes in this situation without supportation, is also rare. We once not with a case of this sort in which the gland formed a tomor nearly an inch in diamster at the upper part of the cooplagus, causing pressure symptoms recessitating trachestomy. The growth was at first thought to be maligment, but completely disappeared after a summer in the country.

Retro-couplingeal abscess may result from the breaking down of tuberculous lymph nodes in the posterior mediastinum, and may give rise to symptoms like those which result from an abscess due to Polt's disease.

Perforation of the cooplagus and a food-fistula connecting the cooplagus and the traches may result from alcoration caused by a tracked randa or by a foreign body. This may be accompanied by abscess.

The most common variety of retro-esophageal abscess is that due to Pott's disease of the lower cervical or upper dorsal region. The symptoms are obscure, and an exact diagnosis is not often made during life. Death may occur quite suddenly when the previous symptoms have been so slight as to be easily overlocked. The following is a fair example:

A girl two years old was admitted to the Babes' Hospital with caries of the upper dorsal region of two months' duration. The putiend was kent in hed and a plaster of Paris jacket applied. About a month later dyspnea was first observed; this was at times quite intense, and again almost absent. It was always on inspiration, expiration being easy. No explanation for this was found in the lungs. There was no difficulty in suallowing, and very little cough. After these symptoms Ind lasted for about a work, the child while eating was saddonly sented with violent dyspoes, and in a few moments became completely asphysiated. Trachestony was immediately fone, and by means of artificial respiration the rationt was restored to comparative comfort. About two boars later a second attack occurred, and the patient died in an hour. At the autoper there was found an abscess a little larger than a brn's egg, containing abend two conces of carely pas, excelying the bolice of the first three denal pertebrae and communicating with those. These vertebrae were carious. The right postmogastric nerve, an inch and a half above the bifurcation of the tracken, was compressed between the absence and a large inherentons lymph node, with the capsule of which it was blended. In the lungs were a few small tuberculous deposits and the usual confitions found in death by asphyxin. The dyspies seems to liave been of

nervous and not of mechanical origin, and raused by irritation of the preumogastric. The fatal issue was apparently from an increase of the pressure upon the nervo.

We have seen but one other case, and this closely resembled the one reported. In the thorteen cases collected by Griffith the symptoms in all were much alike. Dyspace, usually of a spasmodic character, was prominent in nearly all, and generally it was the most prominent symptom. It was more marked on inspiration, and often accompanied by a spasmodic cough, suggesting laryupeal stenesis. The voice was affected in but two cases, in one complete aphonia being present. It is striking that in no case was there any difficulty in scallowing, in marked contrast to retropharyugeal abscess. Swelling in the neck was noted in but three cases. Spinal carses was started to be present in seven cases and absent in two. The final attack of asphyxia semetimes came without varning, sometimes was preceded for several days or longer by milder attacks.

The diagnosis of this sombition is very difficult, and a positive diagnosis almost impossible. It may be suspected in cases of Pott's disease of the lower servical or upper dorsal regions, when there is spasmodic inspiratory dysposa, especially if accompanied by irritative cough. It should, however, be remembered that precisely similar symptoms may depend upon the irritation of a inherentous node, and that the subless asphysis is exactly like that caused by the electration of such a node into the tracks or a large bronchus. The latter, however, may occur without the presence of Pott's disease. If the abscess is higher up, there may be a welling on either aide of the neck, just above the clarkle. In most of the cases there are no external signs of disease. Such abscesses are too low to be reached by digital examination of the planyra. The attack of asphyxia may also be confounded with that due to the presence of a foreign body in the largex.

The prognosis in cases of retro-esophageal abscess is exceedingly bad.

Death usually results from pressure upon the pneumegastric, as in the cases reported. The abscess may rupture into the esophages and receivery follow. This termination is very rare, but such a case has been reported by Knight. A fatal one is reported by Lesciner and Lambl. The abscess may burrow along the coophagus into the abdominal cavity and excite perstenitie; finally, it may open externally.

But little is to be said under the head of treatment. The symptoms are rarely definite enough to justify a radical surgical operation. Trackeotomy gives but temporary relief to the asphyxis. This operation should be performed, however, in every race, because of the impossibility of making a diagnosis of retro-coopingeal abscess from other conditions in which the operation might be curative.

CHAPTER V.

DISEASES OF THE STOMACH

In is difficult wholly to separate diseases of the stomach from those of the intestine. Although in older children they are often quite distinct, in infancy they are more frequently associated; but at one time the gastric symptoms may be prominent, and at another the intestinal symptoms. Functional disorders particularly are likely to involve the whole tract. Serious organic besions are more frequently limited in their extent either to the atomach or to the intestine. The former are rare, while the latter are very common. The diseases in which the stomach is alone or chiefly involved will be considered by themselves. Those in which both the stomach and intestine are involved are classed with the intestinal diseases, as the intestinal symptoms usually predominate.

DIGESTION IN INFANCY

The first step in the process of digestion in the newly-born infant is sucking. During this act the nipple is grasped between the lower lip and tangue below, and the upper lip and jaw above. The back of the mouth is closed by the pulate. A strong downward movement of the lower jaw causes a partial vacuum in the mouth, and produces the section force which causes the milk to flow. Sucking can be carried on only when the most is free for resperation and the pulate and upper jaw infact. Children with deformatics of the mouth, like cleft pulate and hardip, suck only with the greatest difficulty, and complete most obstruction prevents surring.

The Saliva.—This is present at birth only in very small amount, and the part which it plays in digestion in early infancy is an insignificant one. During the third and fourth mouths it increases markedly in quantity, and at this time it possesses quite actively the power of transforming starch into sagar. This property is present only to a very slight

degree during the early weeks.

The Stomach.—Our knowledge of the anatomy and physiology of the infant's stomach has been greatly increased through the use of the X-ray. The position varies considerably in normal conditions and very greatly in pathological conditions. The stomach is usually somewhat obliquely situated in the abdomen, not only from side to side, but from before tackward, as the cardiac orifice is quite near the spine while the pylorus is much anterior. The pylorus is usually considerably to the right of

the median line and generally situated somewhat behind the pyloric third of the storach.

When inflated after death the normal infant's stomach resembles a curved cylinder with a greatly shortened superior border. After the first year the great development of the fundus occurs and the shape is much like that of the adult stomach. During life the shape of the stomach varies greatly with the amount of food and gas it contains and with the condition of its mineralar walls, whether relaxed or contracted. It enlarges with great facility with the introduction of food. In conditions when there is a lowered muscular tone, as in rickets or malnutrition great changes in size, shape and position are met with. In some cases the stomach is almost entirely to the left of the median line. The almormal shapes are temporary or permanent, according to circumstances, and no doubt have much to do with the facility with which the stomach empties itself during digestion.

In the nursing infant, food begins to leave the storach almost at once, and within five minutes a very considerable proportion of the amount taken has often reached the intestine. At the end of half as hear the greater part of the food has neally left the storach. In infants taking cow's milk, the food passes one more slowly but after the first few minutes food is seen in the intestines. The opening of the pylorus is much influenced by the reaction of the gastric contents. It normally opens when a certain degree of acidity is reached. The addition of alkalis to cow's milk marketly delays the emptying of the storach. This is also influenced by the composition of the food; when the food contains a high fat percentage, emptying of the storach is much delayed. The whey first reaches the intestine, afterwards the casein, and lastly the fat. Solid food is retained in the storach a larger time than milk.

The storach always contains gas, and, by the X-ray, after every feeding a large bubble of gas is seen above the food, often half filling the storach. Most of this gas is air that has been swallowed. In conditions of disscalered digestion the amount may be very great. There is a natural tendency for the storach to contract and expel this gas after taking food; but if the infant is placed upon his back and kept there, this is mechanically impossible, as has been well shown by the investigations of C. H. Smith.

Gastric Direction.—The role of the atomach in digestion is not so important in inflants as in adults. The gastric part of digestion is only preliminary and partial; the major part of digestion takes place in the inflants. While the function of the stemach is largely that of a reservoir into which the milk is received and from which it is allowed to pass gradually into the intestines, certain definite changes take place

there chiefly owing to the activity of the remed ferment and the gastric lipuse. It was until recently believed that the action of the gastric juice was chiefly upon the protein of the food by virtue of the pepsin and hydrochloric acid contained in it. It has been shown, however, that for each gastric ferment a certain concentration of acid is necessary for its activity. In a large series of cases, different observers have determined that the concentration of acid in the gastric jusce of normal infants fed upon cost's milk is low, much less than that of adults. Pepcin is inert in a solution of such weak concentration. It is therefore altogether probable that gastric digestion by pepcin is practically negligible. Nevertheless, pepcin is found in the stomach at birth and may even be demonstrated in the fetus us early us the fourth month.

The concentration of acid in the stormels, although monfleient for the action of papers, is sufficient for the activity of the remost forment and the lipase. Congulation is the first change which milk undergoes in the storach. Weman's milk congulates in loose floculi and quite imperfectly, while cow's milk congulates in much firmer, more compact masses, owing to the larger amount of casein. The motility of the storach plays an important part in digestion. The churning movements soon break up these casein masses into much smaller particles. Remost has a feeble digestive action upon protein. Many good authorities consider that remost is not a separate substance but that congulation is one of the properties of pepsin. The question is as yet undecided but pepsin and remost are always present in conseponding amounts. It has been shown that a lipase or fat-splitting ferment is present in the stomach even of infants and that it increases the activity of the panercatic lipase. Its importance in the stormach is not clearly known.

Pepsin is found in the stomach at birth, and even in the fetus as early as the fourth month. In lifteen minutes after feeding the reaction of the stomach contents is always acid. Free hydrochloric acid can not recally be demonstrated until about an hour after feeding, then only in small quantities, and in very many cases not at all. The reason for this is, that the acid combines with the case in and the salts of nails, those of now's milk in particular having a great power of combining with hydrochloric acid.

The duration of gastric digostion suries with the age of the infant and with the food. During the first month the stomach of healthy nursing infants is usually found empty in an hour and a half after feeding, often in one hour. In these taking cow's milk the average is at least one hour longer. In infants from two to eight months old the average is two hours for those receiving broast milk, and two and a half to three and a half hours for those fed upon cow's milk. The time is influenced by the size of the meal taken and by the composition of the food. The higher the proportion of fat in the need, the longer the food is retained in the stomach, and also the smaller the amount of gastric juice secreted. Very little absorption takes place from the stomach. There is here absorbed a certain proportion of sugar and poptones, but practically no water, fat, or salts. The amount of gastric juice secreted is very large. In experiments upon animals it has been shown to be nearly as great as the volume of nulls taken.

The bacteria of the stourach are very few as compared with those of

the intestine, and no varieties are constantly present.

The Intestines.—The length of the small intestine at hirth is about nine feet; that of the large intestine about eighteen inclose. The great length of the sigmoid flexure is the most striking peculiarity, this being nearly one-half the length of the large intestine.

Intestinal Dijection.—All the important elements of feed—protein, carbohydrates, and fat—are acted upon by the pancreatic juice. The protein is converted into poptones by trypsin. The digestion of protein is completed by the crepsin of the intestinal juice, which converts poptones and allumoses into amino acids. In this form the nitrogeness portion of the food is finally absorbed.

The amylolytic ferment of the panerens has the power of converting starch into mallose. This action is feelfe during the first four or fine months, but is present even in early infancy. Milk sugar is changed into galactose and glucose, and came sugar and multose into glucose through the agency of the intestinal and panerentic juices. Fats are partly studsified and partly supomified by the panerentic juice in connection with the bile.

Absorption.—From the small intestine absorption takes place very rapidly. The protein is absorbed in the form of peptids and amino acide Sugars of all varieties are changed to glacoss during absorption. Fat is absorbed in the form of fatty acids and soaps; but in their passagthrough the wall of the intestine the futty acids are converted into neutral fats. Absorption from the large intestine, except of water, is quite imperfect. Fat absorption is very slight. Sugar, salls, and peptones, however, may be absorbed with moderate facility.

Intestinal Bacteria.—For the fundamental work upon this subject we are indebted to the researches of Escherich. Bacteria are absent from the entire gustro-subsric tract at birth. They quickly eater by the mouth and rectum, and by the end of twenty-four hours they are usually found in all parts of the intestinal tract. The measurism bacteria are derived from the inspired air, and hence vary somewhat with surroundings. As soon as the ingestion of milk begins these varieties are displaced, and throughout the period in which the infant has this food exclusively, there have been found in boalthy conditions but few varieties which are one-

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stantly present. These are the b. Artis aerogenes the b. coli consumic, and the b. bifulus. The number of factoria varies in different parts of the intestine. They are found in greatest numbers in the occurs and colon, and are relatively few in the small intestine. The b. factis nerogeness a found most abundantly in the upper part of the small intestine, in small numbers only in the colon, and according there are none in the frees.

The h. can communic is found in but small numbers in the upper small intestine, becoming more abundant lover down. In the colon and in the foces it is present in considerable numbers. The most abundant organism in the large intestine, however, is the h. bifons. A change from a milk doct to a mixed diet of meat and farinaceous food produces a marked change in the character of the intestinal bacteria.

Feeta.—The first discharges after birth consist of meconium; this is of a dark brownish-green color, semi-solid, and recally passed from four to six times daily during the first two or three days. On the third day the stools begin to change in character, and by the feurth or fifth day they have usually assumed the appearance of normal milk-feets. Under many abnormal conditions the stools may continue to have the character of meronium for a week or more. Meconium a composed of intestinal macus, bide, the verms cascon, spithelial cells from the spectrums, hairs, fat-globules, and cholesterin crystals. For its formation there are necessary the secretions of the intestine and the liver and the availability of a considerable amount of amnietic fluid.

Mills-foccs.-The amount of feces discharged daily by a healthy pursing infant is from our to two ounces (20-60 gms.). Such stools have the color of the tolk of egg but may be paler, and from time to time even slightly greenish. They are seldem entirely smooth and homogeneone but usually contain a large number of small light-vellow particles. The oursitizery is butter-like but often rather losses than this. Under normal conditions the stools are never watery. The reaction is acid, and there is a slightly sour but not unpleasant other. It depends upon the prosence of factic and acetic acids and higher fatty acids. The color is due to biliravin. The stools of an infant fed upon cow's milk may, in conditions of perfect digostion, differ little from those just described: nemally, however, they are firmer, rather more homogeneous, of a puler sellow color, and may be neutral or even alkaline in reaction. The normal stool of a nursing infant has about 75 to 86 per cent water and 20 to 25 per cent solide; that of one taking cow's milk has about 70 to 75 per cent water and 25 to 30 per cent solids.

The only gases present are hydrogen and earlien diexid. Sulphuretted hydrogen and murch gas, to which the odes of adult stools is largely

due, are not present.

The solids of the stools are chiefly fat, solts and nitrogenous matters, Sugar is not found, but its derivative, bette zeid, may be present in small amount. The fat forms nearly 40 per cent of the dried matter of the normal sheel of the nursing infant; nearly 10 per cent of this fat is in the form of soups; 35 per cont, free fatty acids; 15 per cent, neutral fat. In the normal stools of infants fed upon cow's milk about 35 per cent of the dried matter is fat of which nearly three-fourths is in the form of scape. The inorganic saits form about 10 per cont of the dried matter of the normal stool of the nursing infant, and from 26 to 30 per cent of that of the infant taking new's milk; in both more than four-filths of the total is calcium phosphate. The nitrogenous elements of the cours-milk sheel form about 25 per cent of the dried matter but only a small part of this represents unabsorbed protein. The chief source is intestinal secretions and the bodies of bacteria. Amino-acids, representing maheorised food protein, form from 8.4 to 24 per cent of the nitrogen of the stool. The protein of woman's milk is almost all absorbed.

A healthy norsing infant absorbs from 90 to 98 per cent of the fat taken, from 85 to 95 per cent of the protein, and from 80 to 85 per cent of the salts. A healthy infant taking cow's milk absorbs about 85 to 90 per cent of his ingested fat, about 90 to 95 per cent of his protein, and about 60 per cent of his salts.

The biliary elements present in the stool are hydrobilirabin, unchanged bilirabin, and abolesterin. The presence of biliary acids is doubtful. Macus is always present in considerable quantity.

Microscopically there are seen epithelial cells, chiefly of the columnar variety, a few round cells, mucous corposeles, fat globules and crystals of fatty acids, cholesterin, raucin, crystalline inorganic salts, sometimes bilirabin in crystals, yeast fungi, and bacteria in immense numbers.

If the infant is taking a food containing starch, this may appear to a greater or less extent in the stools, a larger amount in the case of very young infants.

The number of stocks of breast-ded infants during the early weeks is from two to six daily. After the first month two stocks a day are the average; many infants have three, many others but one. With medified cow's milk the stocks are seldom more than one or two a day and there is frequently constipation.

As soon as an infant is put upon a mixed diet, the peculiar characters of the stools disappear, and they come to resemble more closely those of the adult, though remaining offer throughout infancy. They become darker in color and assume the adult offer, while retaining their acid reaction. The harteria, while still in great numbers, are more varied than are not with in milk-feces.

MALPOSITIONS AND MALIORMATIONS OF THE STOMACH

The stamesh is sometimes in the thoracte cavity in cases of displangmatic hernia. It may be found in a vertical (fetal) position, variously adherent to the colon and small intestine. Malformations are much less frequent than those of other parts of the alimentary tract. These may be atrests or stemula at either orifice, and very rarely a constriction is found near the middle of the organ, deciding it into compartments. The symptoms of atrests at either orifice are perceibed regargitation or counting, and death in a few days from insuition.

HYPERTROPHIC STENOSES OF THE PYLORIES

This condition known also as congressed elements of the pulsars, or simply as pulsars elements of infancy, is not an uncommon one. It is characterized by persistent steniting, construction, wasting, marked visible gastric peristales, and usually a palpable tomor. It is a servous condition, and unless recognized early and properly treated at has a high mortality. It is seen in early infancy, usually in the first two months of life but schlam in the first two works. Fully four-liftles of the cases occur in male infants. It has no relation to feeding, the large proportion of recorded cases larging been seen in nursing infants.

The pathology of stenosis of the prisons in early infancy is somewhat obscure and at the present time quite diverse views are held. It a believed by some that the primary and essential combition is one of spasm; that the hypertrophy when it is present is secondary; that in a very considerable proportion of the cases there is only pylomepusm without hypertrophe; that with proper modical treatment most cases recover, and that surgical intervention is rarely called for. The other view and that which seems to barmonize lest with the clinical symptoms and the pathological findings is that the primary condition is one of hypertrophy which is congenital; that to this, sporm is added; that in all cases both factors-hypertrophy and spasm- are present; that while the cases differ in degree they are the same in kind; that while many of the milder ones may recover without operation the severer ones should be treated surgirally. Spasm certainly plays an important part in the production of symptoms; but to regard this condition as one essentially of muscular spaces sector to us erroments.

The appearance of the pylorus when seen at antopoy or operation is remarkably uniform. It forms a bard, whitish tumor about the size of

a peaner, of almost carteleginous consistency. Its homes may be so narrowed as barely to admit a fine probe, while the normal pylorus will smally admit a Ne, 21 cound, French scale. Frequently water can not be forced through the stemosis owing probably to the fact that the mucous membrane is thrown into fields. The walls of the stemach are often hypertrophical, especially toward the pyloric end. The stemach is usually much dilated; its lower border may be below the navel. On section the pylorus is found to be much this sensed and by microscopical examination this is seen to be chiefly of the circular muscle filters. This contappears to be two or three times the normal thickness. The other coats—submiccons, mucous and longitudinal muscular—are thickened but to a much loss degree.

Symptoms.—The chescal picture is a striking one. Symptoms rarely begin in the first seek of life. An infant who for the first two or three weeks has usually shown no signs of gastric disorder, and often habeen norsing and gaining regularly in weight, begins, without evident cause, to venit; at first occasionally, but soon followally. This vomiting in a short time becomes foreible, projectile. It may be of this type almost from the outset. Changes in diet have but a temporary effect upon it, or none at all. The bowds are constipated. The infant wastes steadily, the scales often showing a lose of one or two sumen a day. There is no fever and little or no evidence of pain. There is progressive failure in matrition and death may occur from exhaustson in from four to six weeks from the beginning of marked symptoms.

Psyching.-The number of vomiting is sharm-teristic. It is more forcible than that seen under any other condition. An infant will often fairly shoot out the contents of the stomach to a distance of three or four feet. Food frequently comes through the note. The vomiting usually has a relation to the faking of fool. It most frequently comes directly after feeding, sometimes even while the child is still at the breast. After an attack of comiting, nursing is cometimes resused with avidity, showing a distinct absence of the usual symptoms of gastric indigestion. All the food is generally expelled at one time. The frequent regargitation of small amounts is unusual. Generally vomiting does not occur at night unless the child is nursed at that time. The vemited matters at first consist only of food, often but little changed. After a time there is muchs, sometimes in large quantities. The amount somited at one time is often considerably greater than the feeling just taken, indicating a considerable retention of food in the stomach. Since of these children romit regularly after every feeding; others retain two or three feedings and then expel the whole amount. The frequency of counting varies from ones or being to six or eight times a day. Owing to the loss of fluid by vomiting the urine is usually very scenty. There

is no uniform change in the gastric secretions, but there is frequently hyperacidity present.

Boxels.—Obstinate constigution is the rule. It is due to the fact that so much of the feed taken is vemitted. If the pyloric obstruction is complete the stools resemble reconsum.

Weating.—Progressive weeting is one of the striking symptoms, and a close observation of the weight one of our best guides to the progress of the case. If the less amounts to two or three concess a day the condition should be considered most critical. The rate of the loss depends naturally upon the completeness of the obstruction and it is proportionate to the amount of comiting and the degree of constipation.

General Appearance.-- At first nothing abnormal is seen, but soon



Fig. 31.—Guerrate Presentates or Pressure Stateous. (Thomson)
Patient-night works old.

all the eridences of rapid malnutrition are present, without, however, the other usual symptoms of indigestion, such as might be expected with the tentiting. The tongue is usually clean; the appetite often voracious; there are no eructations of gas; the breath is sweet, and the color usually good.

Periofalsis.—On examination of the abdomen the apagastrium is usually full and the lower half of the abdomen may be sinken. If the skin is bared and the patient placed in a good light the characteristic peristaltic waves are even which are the most diagnostic feature of the disease. One should not expect to see them if the stomach is empty; they are best seen immediately after taking food or water. When not appearing spontaneously they may often be excited by slight fraction or tapping of the opigastrium. There is seen a slowly moving wave from left to right, First a ball-like tumor appears just below the ribs on the left side (see Fig. 31). It is usually about one and a ball to two inches in diameter and slowly moves toward the right. It usually disappears just beyond the median line. Sensetimes one wave is quickly followed by another. Peristales of the introduct in rare cases, may somewhat resemble these movements; but typical gastric contractions can buildly be mistaken for anything else. After marked peristaksis voniting frequently occurs.

Tower.—The hardened pylorus can with experience be felt in most cases. It may be obscured by distention of the stomach or the relon or by indergement of the liver. The pylorus may be displaced. The position of the tunior is therefore of less importance in diagnosis than its character. It is usually fest about one and a half to two inches below the free border of the rile, just moids of the right mammary line. It may be felt only during active peristals is. It appears somewhat smaller than the little finger and about three-fourths of an inch long.

Gastric Releation .- The prolonged retention of food in the stomach is one of the characteristic features of paloric stenosis. In healthy nursing infants the stomeh is regularly found empty at the end of three hours, often at the end of two hours. But if stenosis is present, food in considerable amount is almost invariably found after three hours and, unless comiting has occurred, usually after four hours. Sometimes this is also the case when there has been somiting. This retention varies in amount, but when there has been no vomiting for several hours a larger amount may be removed than the last feeding taken, sometimes twice as much. Early in the morning after fasting eight or ten hours the stomach may contain three to four somes of partly digested food. Abnormal gastric retention is one of the diagnostic features of pylonic stenosis. Gastric retention is best estimated by the removal of the stemach contents by means of section. By this it can be determined bow rapidly the food leaves the stomach quite as accurately as by the X-ray and in a much more convenient way. Not only is the X-ray unnecessary for diagnosis, but the administration of the large dozes of hismath for diagnostic purposes is objectionable and may even be dangerous in these very mong patients. We have known of two instances in which its use was apparently the factor which determined the fatal result.

Course of the Dionne.—Two types of cases are seen: (1) the secure form, in which the peristalsis and vomiting are but little influenced by medical treatment; the loss of weight is continuous and often amounts to two or three comes a day; there is very little feeal matter in the stools; the constitution is very marked, and, unless relieved by operation, the condition generally proves fatal in from two to four weeks; (2) the mild form, in which the symptoms, though characteristic, are all much less marked, gastric peristals and times are present, but the conditing is only occasional, feed stools are passed, the last of weight is not so marked and progress may alternate with periods of improvement in which there is gain in weight. Very many of these cases recover without surgical aid, the chief danger being that the feeble infant is cut off by intercurrent disease. Whether there is a chronic form of infantile stensess which persists into later childhood seems probable, but is not yet established.

Diagnosis.—The diagnosis of pylotic stenois of infancy is usually easy after a few days of observation, but may be impossible at the first examination. The time of onset and nature of the comiting are strongly suggestive but not quite conclusive. The abrupt development in a norsing infant from two to four weeks ald of severe weniting without assignable cause and its persistence in spite of all treatment, should always lead to the ampirion of pyloric stenosis. The diagnostic features of this condition are three: waves of gastric peristalsis, abnormal gastric retention and a tumor. The existence of a tumor may be a matter of some uncertainty in many cases, but its presence is of considerable positive value. The condition has been mistaken for cerebral disease on account of the projectile comitting and chronic constitution; for renal disease, because of the vomiting and scanty urine. Usually, however, the only difficulty is to distinguish between the vomiting of gastric indigestion and that of pyloric stenoris. Gastric indigestion is an exceedingly common symptom in infancy; but it is not very common in sursing infants and rarely develops suddenly. The remiting is sut to be in small quantities and many times repeated and generally occurs at a longer period after feeding. There are undoubtedly some cases of gastric indigestion in early infancy in which a temporary pylorospassa occurs, but this condition is quite different from the one we have under consideration. The existence of persistent spasm of the pylorus without hypertrophy has yet to be proven.

Impairment of motility is a symptom of gastric indipostion but in this condition the food seldom remains in the storagh for so long a time or in such amount as in stenosis. Besides it is noncompanied by gastric

peristalsis or a tumor.

Congenital obstruction of the dusdroum or other part of the small intestine may lead to persistent, forcehle vomiting and, if the obstruction is high up, even to visible gastric peristals is. But in these cases, whether due to stenosis, atresia, twisting or pressure from bands, the symptoms appear soon after birth and the severe forms are fittal in a few days. The vomited matters consist of bilious material.

Prognosis.—Statements regarding prognosis will depend much upon what cases are included under the diagnosis. Limiting the term to the cases defined in the beginning of this article, the condition must be considered a serious one, often ending fatally unless properly treated. By older methods of treatment, fully 50 per cent of the children died. Of the last 86 operations done at the Bubbles' Hospital, the mortality was 17.4 per cent, out these figures include a considerable number of cases admetted very late in the disease in which the patients' condition was apparently hopeless when operated upon. With a fairly early diagnosis and resert to surgical treatment, the mortality in skilled hands should not be over 8 or 10 per cent. In any given case the unfavorable symptoms are rapid and continuous loss in weight, i.e., one to three ounces a day, continued vomiting and meconium-like steeds, both showing that little or nothing passes the pylorus. The lower the body weight has fallen before operation, the worse the prognessis, although we have seen a child recover whose weight at the time of operation was only four and a quarter pounds.

In cases not operated on complete recovery may result, though the tumor and artive gastric periotals is may persist for seven or eight mouths. Whether this condition may give treatile in later life cannot yet be definitely stated. The hypertrophy is certainly very slow in disappearing. A tumor has been found at autopsy in children dying of intercurrent disease as long as six months after recovery from all

symptoms.

Of 220 rentime cases which have come under observation at the Babies' Hospital, including a large proportion of severe cases and many hopeless on admission, the general mortality was 33 per cent; but the death rate has fallen steadily with an earlier resort to operative treatment.

Treatment.-The treatment adopted will depend upon the type of case with which we have to deal. With all cases, medical treatment abould be given a faithful trial. If the patient is seen early this may safely be continued for a period of at least one or two weeks. With a large proportion of those previously classed as belonging to the mild type, medical treatment will be successful. The cases which are likely to recover usually show decided improvement in a few days,-less rounding, fecal stools, siminished peristales and a stationary or slight gain in weight. If, however, when first seen, symptoms have already lasted three or four weeks without material improvement, or if there has been a steady though not rapid loss in weight, operation should be advised. Though some of these cases might recover without it, the risks of waiting are greater than the risks of the operation. Again, operation should be resorted to early in all cases classed as the severe type which show to improvement by medical treatment in a few days. If the child's condition is bad, no delay is admissible.

Medical Treatment.—This is carried out on the theory that the pyloric spaces to which symptoms are chiefly due will gradually subside if nutrition can be maintained. It counts in diet and stomach washing. If a child is nursing and the milk is normal, weaning is not advisable. Small meals, not too near together, are essential. The breast should be given at four-hour intervals, and the nursing period varied from two to five minutes, according to the amount obtained. It is often advantageous to pump the breasts and give a measured amount of breast-milk. Usually for a child a month old not more than two nunces should be allowed at one feeding. On no account should an infant be weared immediately because of the development of the symptoms of pyloric stenosis. For some infants who have been artificially fed nothing succeeds as well as a wel-nurse. The chief objection to the breast-milk is its high fat which sometimes increases the comiting.

For infants who are artificially fed a few general principles are pretty well established. In all milk formulas the fat should be low, usually fess than that in formulas from whole milk. The formulas from skimmed milk usually succeed best. Peeding should be regular and not eftener than every three lieurs, and in many cases a four-bettr interval is better. The amount given at one time should be from one and a half to three ounces.

Stomach washing is useful to empty the organ of food and mucus and seems to have some effect in allaying spann. Water used should have a temperature of 108° to 110° E, and he rendered alkaline by the addition of one per cent of hierrbenate of soda. The washing should be done about two and a half hours after feeding, and repeated twice in twenty-four hours. It should be continued for a considerable period. In cases which recover it has often been found necessary for six to eight tracks, twice daily, and for three or four mouths once daily. Hot applications over the epigastrium are of hittle value in relaxing spasm. The administration of drugs, especially preparations of optum, is not to be relied upon.

In the milder cases the effect of stomach washing and careful feeding is to bring about a gradual lessening in the comiting and gastric peristales, though it is usually some weeks before any material gain in weight is seen. Relapses are not uncommon.

Surgical Treatment.—Several different operations have been proposed, but only two have been frequently performed; gastro-enterostomy and a form of pyloroplasty known as Rammetedt's operation. In the latter the circular minecular layer is divided externally without opening the storage. After this is done the pylorus opens and food passes readily into the intestine. With personal observations extending now to over 150 cases, some of which have been followed for three and four years, it is possible to speak with positiveness as to the advantages of the Rammeteds operation. It requires but fifteen or twenty minutes, while gastro-enterostomy requires fully twoce as much time; it involves much less handling of the abdemical viscera; it is followed by much less shock; there is less subsequent comitting; convalescence has been more rapid;

fluids pass directly through the natural channel, and distribes has been seen much less frequently than after the other operation. While few of our cases have as yet been followed longer than three years, up to the present time all the advantages seem to be with this operation.

The after-treatment is exceedingly important and the outcome depends almost as much upon this as alson the operation itself. Feeding may be begun as soon as the child has recovered from the anesthetic. The food, if possible, should be breast milk. By all possible means should the mother's milk be conserved. Beginning with one or two tempoonfuls, it may be given every two hours, alternating with the same amount of water, the amount being gradually increased and the interval lengthened so that the child at the end of forty-eight hours is usually taking one ounce of milk every three hours, and the same quantity of water between the feedings. At the end of a week or ten days the infant may in most cases be put back to the breast, but the amount taken at one time should be limited and the nursing closely watched. In the beginning not over one or two minutes' nursing should be permitted. Unless the baseds mayo freely, from one-half to one teaspoonful of caster till should be given twenty-four hours after operation. The vomiting which not infrequently occurs occasionally for one or two days may sometimes be relieved by keeping the head of the child's rrib considerably elevated, or supporting him in a semi-sitting posture and by putting him over the nurse's shoulder from time to time to enable him to get rid of the gas in the stomach, or by the occasional introduction of the stermen tube.

Hypodermiclysis is a procedure of much value, sometimes before and nearly always after operation, since these infants are smally suffering greatly from the lack of water. From 150 to 240 c.c. of a normal soline solution may be given, and in lad cases repeated daily for three or four days. It is often advantageous to add to the soline if per cent of glucose.

The shock of operation with most of these patients is surprisingly little. With careful feeding favorable cases begin to gain weight within a few days after operation and in a few weeks are apparently as well as ever. Cases we have followed for three or four years do not sufer subsequently from dignetive disturbances more frequently than do other children.

Operation is to be looked upon not as a last resert in a condition well-nigh hopeless, but as offering in the hands of an experienced surgeon an excellent prospect of recovery. The statistics of the Rammstedt operation at the Rabies' Hospital new include 153 operations, chiefly by Downes, with a mortality of 20.3 per cent.

With an experienced surgeon the result is modified by nothing so

much as by the duration of symptoms. Of cases in which operation was done within the first four weeks of symptoms the mortality was less than 2 per cent; in those in which symptoms had lasted more than four weeks it was ever 50 per cent. (The results of medical and surgical treatment cannot well be compared, for they usually refer to quite different groups of cases.)

VOMITING

Vemiting is one of the most frequent symptoms of disease in infants and young children, and occurs from a wide variety of causes. The physician must have in mind both its common and its uncoronen causes. Vomiting takes place with great facility in young infants even from alight causes, owing to the position and shape of the storach.

- 1. Varniting from Overfilling of the Stornech.—This is often seen in nursing infants, and there may be no other symptom of disease. It comes within a few minutes after nursing, is easy and without effort, and the food is but little changed. It may be excited by moving the child or making under pressure upon the stornach, and requires no treatment except to diminish the quantity of food. Vomiting also comes from distention of the stornach with gas, most of it being air which has been swallowed with nursing or feeding. It is relieved by placing the child in an upright position or over the shoulder before he is put in his crib.
- 2. Vomiting is almost invariably present in cases of scale quetric indigestion and scale guidritis. With the former it does not usually come immediately after feeding, and it may be delayed for several bours; with the latter it is usually persistent. The somited matter consists of the contents of the stemach, but often mores, and, in severe cases, bile and traces of blood may be comited for some time afterward.

 In the hypertrophic stensor of the pylorus of early infancy, uncontrollable vomiting without fever is the principal symptom. (See previous Chapter.)

- 4. In scale infestional abstraction counting is rarely about, and in most cases it is persistent. In the newly-born, persistent comiting is almost invariably dependent upon congenital obstruction of the intestine, which is most frequently in the doubleman. In multiormations of the colon and rectum it is less constant and appears later. In intrespection, comiting is forcible, immediately excited by the taking of food, and is at first bilious, but later may become focal.
- Vomiting is a frequent and almost a constant symptom of noute peritonitis, whether localized or general, of which appendicits is the usual cause. It is then associated with abdominal distention, tendernous, and fever.
 - 6. In certain necessar discours, especially tumor of the brain and

acute meningitio whether corderopenal or tuberculous, temiting is very common. Cerebral counting is usually forcible or projectile. It may have no relation to meals.

- In infants, and less frequently in older children, ventting is saw of the most frequent symptoms to mark the owner of scade febrile discurse especially the beginning of scarlet fever, preumonia, and malaria.
- 8. An accumulation in the blood of various toric materials may provoke veniting; the test known example is aremia. In cyclic counting it is quite probable that the cause is the accumulation of some toric substance in the blood. The absorption of poisons taken in with milk or other food, or developing in the gastro-enteric tract, may excite remitting. In some of these conditions it is possible that the comiting may be eliminative. The cases dependent open remal disease are discovered by examination of the urine. The other forms are often exceedingly obscure, and recognized only by the exclusion of all other causes of remitting.
- 9. Vomiting may be reflex from irritation in the pharynx. This is frequent in young infants, who may induce comiting by stuffing the suggest into the mouth. In certain cases the irritation from somes in the intestinal tract may cause comiting, and it is possible that even dentition may produce it.
- 10. Habit is a frequent cause, in cases of chronic vomiting, especially in children of a neuropathic constitution. In young infants a linkit may be acquired of regurgitating the food very reach in the manner of the running animals. Soon after feeding there is seen a movement of the mouth and fauces resembling swallowing, then the food appears in the mouth and is ejected without farce. This may be repeated until a large part of the food taken is lost. The habit once formed may continue for months, the nutrition of the infant often suffering to a serious degree. To this condition the name received has been given. It is not difficult of recognition if the infant is clustly observed after feeding.

The most assessful treatment is the administration of a food so thick that it cannot be readily regargitated by the infant in the manner described: e.g., four tablespoons of barley flour is cooked for thirty minutes in one pint of whole milk. From one to two ourses are given every three or four hours with a spoon, as it is too thick to go through a rubber nipple. Water should be given between feedings. Same children have the power of vamiling at will anything in the nature of feed which they do not like, yet who retain other food without difficulty. One such child would tolerate large slows of quintin, to which he had no aversion, without the slightest disturbance. Habit is a potent cause in continuing veniting when from any cause it has occurred frequently In children who have this habit the most trivial cause will provoke it.

It may be present without any other sign of gastric disease, and appears simply to depend upon exaggerated reflex irritability of the organ. We have seen a number of children who up to the third or fourth year objected so strementally to taking solid food that they would immediately vomit it, no matter of what variety or in how small a quantity, although fluids were taken and easily digested.

41. Chronic remiting may depend upon habit, as just described, or upon chronic indigestion; or it may be associated with chronic pulmonary disease—vorniting here being excited by the attacks of coughing, at first only when the paroxyoms are source, and later even when they are

slight.

The diagnosis of a case in which vomiting is the chief symptom may be difficult. The first important distinction to be made is between cases in which the vomiting is of gastric origin, and those in which it depends upon other causes. It is only by a careful consideration of the associated symptoms that an accurate diagnosis can be reached.

The treatment of vomiting is the treatment of the cause upon which it depends.

CYCLIC VOMITING

This is a frequent condition and up to recent times has attracted but little attention except in this country. Although the clinical picture is a very clear and definite one, its exact pathology is undetermined. It has also been described under the names perceived consisting and recurrent remissing. It is characterized by periodical attacks of comiting, which recur at regular or irregular intervals of weeks or months, apparently without any adequate exciting cause. The usual duration of the attacks is two or three days, during which all attempts to control the venciting are without avail, but at the end of this time it generally censes spontaneously.

Eticlogy.—The first attacks are usually seen between the ages of two and four years, but they may date back to infancy. The two sexes seem to be almost equally liable. A few of the patients are strong children, but the great majority are rather delicate and of a highly nervous temperament. The cases are seen chiefly in private practice, ofter, occurring among those who have the best surroundings. In most cases the antecedents of patients are of a neurotic type. The attacks are not usually inscrable to distinct or flagrant errors in diet, and yet the habitual diet seems to bear some relation to the disease. The exciting cause is often a nervous one—great fatigue or unusual excitement, sometimes a railroad journey or a child's party; in many instances it

seems to be induced by some minor illness having no relation to the digestive tract, such as an attack of tansillitis or brought is. In children subject to this condition serious diseases, such as scarlet fever or meades, may be subject in by prolonged and repeated vomiting, which usually reases before the end of the febrile period. General anesthesia, specially by other, is very likely to precipitate an attack.

Symptoms.—The clinical picture presented by these cases is very characteristic, and is well illustrated by the history of the following case:

The patient was a well-neurished loy of six yours when he first came under treatment. He belonged to a negrotic family, and the attacks dated back to infancy. From this time they had recurred usually at interrals of a few months; occasionally five or six months would pass withcert one. The symptoms in all the attacks were similar in kind, differing only in degree. They were preceded by a prodromal period lasting from twelve to twenty-four hours, marked by languor, duliness, dark rings under the eyes, loss of appetite, and a general sense of discomfort in the coignstrium. At this time the temperature was generally slightly devated. The voniting then began enddealy. It was attended with great retribing and distress; it was aften repeated every half-hour or hour for two days. On one occasion it occurred seventeen times in a single night. Voniting was immediately excited by the taking of any food or drink, but it occurred also when nothing was taken. The womited matters consisted of frothy mucus and watery material, frequently streaked with blood, are arently from the rielence of the emesis, and often containing bile. The temperature nearly fell to about 100? F, when the vomiting began, and continued at or below this point throughout the attack. By the end of the second day the exhaustion was very markedso severe, in fact, as apparently to threaten life. The child lay in a semi-stupor, with eyes half open, lips and tongue dry, rousing at times to beg for water. The pulse was rapid and weak, and sometimes slightly irregular. There was no distention of the abdomen; it was usually flattened. By the third day the comiting became less frequent and then ceased entirely. Convalescence was rapid, and by the end of the week the boy was almost as well as usual. The attacks continued to recur at gradually lengthening intervals until they finally ceased altogether at about the twelfth year.

A great number of these cases come under observation. The usual duration of the attacks is one to three days. In one child they lasted regularly for tive days. Severe attacks sometimes last over a week. The average number of attacks is four or five a year.

Prodromal symptoms are present in most of them—headache, general languer, coated inegas, and american are the most frequent; in some there is marked constipation, with a history of very white steels for some time. But it is not measurement for an attack to occur in the raidst of apparently perfect health. The tongue is usually conted at the beginning of an attack, and at its height it is often dry and brown. The abdomen seems empty and its walls sunken; pain and tenderness are both rare. The bowels are usually constipated and move only with difficulty by artificial means. Very exceptionally there may be distribed with foul stools.

There is, as a rule, no desire for food, but the continual cry is for water to quench the constant, burning thirst. The pulse after the second day becomes rapid, soft, and often sensethat irregular. The respiration is shallow, and at times this also may be irregular. The temperature is usually under 100.5° F., rarely it may be 102° or 103° F. The low temperature is a point of much diagnostic value. The patients are dull, apathetic, and wish to be left alone. Headache is very common.

The disposition to wenit is semetimes so great that patients are afraid to move or even to talk lost it may be provoked. The vonsited matter is often large in amount, considering that the patient is fasting. It is coentially gastric juice, containing free HCI, mores, serum, many epithelial cells, and often traces of blood. Less frequently vomiting may scent only two or three times a day. The urine is concentrated, and frequently contains at the height of the attack a trace of albumin, a few hyaline casts, and some blood cells. An increase in the renal secretion may be the first sign of improvement. There is usually an excess of indican both during and between attacks. A condition practically constant, and first pointed out by Marfan, is the presence in the arms of acetone, diacetic and \$\beta\$ explostyric acids. These substances often appear in the urine in large amounts so early in the attack that they can not be sacribed to starvation, and therefore may be of diagnostic value. However, it should be emphasized that acctomria is not the same as acideas; the latter is uncommon in cyclic remiting, though it may occur,

The Nature of the Attacks.—These cases have little in common with the ordinary attacks of indigestion. With our present knowledge they are to be regarded as explosions due to faulty metabolism. They have much in common with attacks of migraine which in later life not infrequently replace the attacks of comiting. The studies of Hilliger upon a child subject to attacks showed that when carbohydrates were withdrawn from the diet the blood sugar fell at once to built the normal and an attack was precipitated. Normal children were not so affected. Hilliger's findings are not invariable, for we have in several instances found a normal blood sugar content shring an attack.

Prognosia.—Aithough these patients very often seem to be most alarmingly ill, the danger to life is slight. We have seen but three fatal cases, and in one the diagnosis is open to question, as no autopsy could be obtained. Griffith reports two fatal cases, the autopsy in one shewing nothing definite. The probabilities are always in favor of a recurrence of the attacks. In most of the patients who have been observed they have extended over a series of several years, although by a careful regimen much may be done to reduce their frequency and diminish their severity. In a considerable proportion of cases they may be stopped alto gether. Toward palerty there appears to be a strong tendency to spon taneous recovery.

Diagnosis.—Organic discuse of the brain and kidneys must first be excluded. The first abtacks witnessed may strongly suggest the onset of tuberculeus meningetis; and only the source of the symptoms may also that this is not present. Usually a history of many previous attacks may be obtained. From acute indigestion, cyclic comiting is differentiated by the fact that the attacks are not brought on by indigestible fixed, and also by the persistence of the running, and the early presence in the urine of the acctone hodies. It is distinguished from gastritis by its accretity, the shorter duration of its symptoms, and its self-limited course.

Appendicitis is excluded by the absence of pain, tenderness, and muscular rigidity; into enception by the fact that the symptoms are less severe, by the absence of blood and muous from the stools, and by the fact that into susception is usually seen in infancy.

Treatment.-When the premonitory symptoms appear, starvation and free purgation offer the best prospect of aborting an attack. If the consting has once began, nothing seems to have the slightest influence in controlling it. It is usually increased by the taking of food or drink or by any medication by the month, and all should be withheld. The patient should be kept absolutely quiet and a saline solution given, per rectum, at regular intervals, usually six to eight ourses, four or five times a day. To this twenty or thirty grains of coloum bicarbointe any be added. This keeps up the urinary secretion, allays thirst and aften restlessness, and when it is retained usually able much to the patient's comfort. When the vomiting has ceased for several hours it is not likely to recur if food is very judiciously administered, at first in small quantities. Broth, thin cereals, whey or small quantities of feed milk and lime-water in equal proportions may then be given. In severe or prolonged cases, six to eight sunces of a 3-per-cent gluouse solution may be given by rectum once or twice a day. If this is not retained, the drip method may be employed.

When aridosis develops, as shown by hyperpnes and laboratory tests, bicarbenate of soda should be given intravenously or subcutaneously as described on page 372, unless the rectum will retain enough to render the urms alkaline. From 150 to 200 c.e. of a 4-per-cent solution is

usually needed. Between the attacks, the alkaline treatment is to be recommended, it consists in giving brombonate of sola in doses of fifteen to thirty grains three times daily and continuing it for many months. The dost should consist principally of most regetables, skinused milk, ecreals in moderate amount, and stale bread. In addition to mreful regulation of diet the general nutrition should be considered, and the patient's life so regulated that extreme fatigue and exhaustion, as well as persons excitement, are prevented.

ACUTE GASTRITIS

In comparison with the frequency of inflammatory diseases of the intestine, those of the stomach are rare, particularly so in infancy. Owing largely to the character of its secretion and its contents, the stomach is much more resistant to infection than are the intestines. Gastritia seldom exists alone, but is usually associated with exteritis or colitis.

Etislogy.—The causes of gastritis are, in the main, these of acute gastric indigestion—suproper food or feeding—to which possibly is added infection. Gastritis may also be caused by the introduction of irritants, which may either be availoused accidentally or given as drugs.

Lesions.—The mucous membrane of the stormeth may be the seat of acute catarrhal, ulcerative, or membraneous inflammation, all forms except the catarrhal being rare. There is also seen a mixed form, which from its cause is usually termed "corresive" gastritis.

Catarrhal Gastritis,-This is characterized by hyperemia of the murous membrane, exudation of cells into the mucosa, a great increase in the secretion of the amoons glands, and changes in the crothelium. About the only change which can be recognized by the naked eye is congrection and excelling of the mucous membrane. These are usually more marked toward the pyloric end and along the greater curvature. There may be small extravasations of blood into the mucesa. The stemach contains undigested food and mucus, which may be thick and tonacious, adhering very closely to the muceus membrane. The mucus may be stained brown from the capillary hemorrhages. The stomach may be either distended or contracted. Under the microscope the changes are seen to be almost entirely in the mucusa. In some places there is less of the superficial spithelium, in others only degenerative changes in it are even. The murosa is infiltrated with round cells, this process being tarely diffuse, but generally occurring in patches. The blood-areads are listended and many small extravasations are seen. Sometimes there is a moderate inditration of the submucous. Soute catarrhal gastrition alone is rarely severe enough to cause death. It is usually seen in cases

which prove fatal from other causes, particularly diseases of the intestine.

tentric inflering (confragalistic) is a condition dependent upon post-mortem changes—probably self-digestion of the storach. It is found both where gustric symptoms were present and where they were absent. It is situated nearly always in the posterior wall, and usually covers a considerable area, about one-third or one-fourth of this wall. It is recognized by the gulatinous, translucent appearance of the walls of the storach, which are so softened that the finger may be pushed through them without force, or that sometimes the storach ruptures while it is being removed. This condition is rarely seen when the storach is empty. It can scarcely be mistaken for a pathological condition if its occurrence is borne in mind.

Ulcorative Guatelitic—This was met with six times, not including tuberculous cases, in 300 consecutive autopoies upon infants in the Bahoo' Hospital. Those of the patients were less than four mouths old, and all were females. The ulcers varied from one twenty-fifth to one quarter of an inch in diameter, and asually from ten to fifty were present. They seldem extended to the muscular, and never to the peritoneal cost. The lesson was most marked in the posterior wall, toward the poloric end and along the greater curvature. Evidences of external inflammation were present in most of the cases, and in four, of membranous inflammation. Lesions in some other part of the digestive tract were present in all but one case, in two there was thrush in the asophagus; in three there was ulcoration somewhere in the intestines.

Membraness Gentellis.—This is even more more than the varieties previously mentioned. We have met with it but four times in infants. One case was associated with a membraness colitis; a second case with a streptococcus inflammation of the fances and largus in an infant but six weeks ald. The esoplagus was not involved in this case; and indeed it often assupes. No Klebs-Leefler bacilli could be found either in coverslip preparations or by culture.

To the naked eye the membrane appears of a grayish-green color; it is adherent, but can be detached in quite large patches. Only a pertion of the stomach is usually affected. The microscopical appearances resemble those of membraneous colotic. There is a pseudo-membrane composed of fibrin, granular matter, epithelial cells, and lucteria. The memora shows a mederately dense infiltration with round cells, and in places superficial electration. There is also infiltration of the submiscous, and in some places even the mescular coat is involved.

Membraneus gastritis occurring in patients dying of diphtheria is not common. Councilman, Mailory, and Pearce noted its presence in only free of one hundred and trenty-seven autopoies.

Corrover timeritis (taric generitis).-This form of inflammation is

excited by surious irritating and caustic substances, taken by accident. The most frequent are carbolic acid and raustic altain.

The lesions in the storach depend upon the amount of the substance swallowed, the degree of concentration, and whether the storach was full or empty at the time. Strong caustics, whether scale or alkalia, asmilly set more deeply and extensively in the observer and ecoplagus, for, owing to the masmodic contraction of the numeles of these parts, often but a small amount of the substance reaches the storach. Concentrated irritant poisons produce in the stormel, especially along the greater curvature, irregular alcors, which nur be so deep as to cause perforation, or they may affect the moreon reconstranc only. In severe cases doubt takes place early, often in a few hours. Dark, ragged alvers are found in the stomach, the surrounding mucous membrane is the scat of intense congestion, and in places these are extravasations of blood. If death is delayed there are evalences of intense inflammation, sometimes with the production of a pseudo-membrane. If the amount of poison is not sufficient to cause death, and if the patient recovers from the resulting gastritis, a cicatricial condition of the stemach results, which later may lead to stenose of the pylorus or other deformity of the stran.

Symptoms. -- Catarekal assignific can not be distinguished at its beginning from an attack of scute indigestion. There is fever, pain, voniting, thirst, loss of appetite, coated tongue, and prostration. The presence of inflammatory changes is indicated by the continuance of these emptons, particularly the pain, voniting, fever, and thirst. With the pain there may be upigastric tenderness. All food and liquids are immediately rejected, and even when nothing is taken the retching and vomiting may continue, nothing but frothy mucus or scenn being brought up, sometimes streaked with blood. The vomited matters are usually very sour; they may be bilious. The temperature is rarely high except at the outset. After the first or second day it usually ranges between 100° and 101.5° F. Thirst is intense, and all liquids are taken with avidity, especially if cold, even though they are immediately venited. The tengue is thickly couled with a white fur, and the breath may be foul. The constitutional symptoms are generally most evere at the outset. The usual duration of such attucks in from four to seven days, but with improper management, especially injuditions feeding, the disease may be much prolonged. One attack may follow another until a chronic condition is established. In most of the cases there is some disturbance of the intestines, usualty a sharp attack of diarrhos. Semetimes the gastrie symptoms subside after a few days and those of the intestines become the predominant ones. The symptoms above given are those in infancy. In elder children there is less fever, prostration, and dearthen, but pain and comiting are prominent. The attacks are smally shorter and altogether less severe.

The rare cases of alcerative postritis have nothing by which they can be distinguished from the form described, except a more prolonged course and a greater liability to bemerrhage.

Membranesse gastrific also presents no peculiar symptoms. In fact, in the cases we have personally seen, the gastric symptoms were insignificant, and the condition not suspected during life.

In oscrosics podrilis the effects of the mustic may be seen in the mouth and pharyns, the mucous membrane being usually of a gray or whitish reloc. Pain and a sense of constriction are felt in the esophagus and stomach, and thirst is great. Vomiting follows almost immediately, and the matters comited are usually bloody. The subsequent course in most of the cases is the rapid development of collapse, and death in a lew hours from shock. The younger the child the somer does the mer terminate. In irritant personing not severe enough to produce death, the symptoms of acute gastritis follow, usually accompanied by more or less enteritis owing to the passage of the irritant into the intestine. There is seen a continuance of the vomiting, pain and epigastric distention, and diarrhea, and from these symptoms death may result in two or three days. It is extremely rare in early childhood for the patient to survive both the stage of shock and that of scute inflammation, so that the deformaties of the stomach and the chronic conditions mentioned are peactically never met with except in older children.

Treatment.—Coos of acute entertial gastritis are to be managed very much like those of acute gastric indigestion. Thirst may be relieved by scallowing hits of ice. Where there is continuous semiting of and mucus, relief is sometimes affected by repeating the stomact-washing once in twelve hours with a one-per-cent solution of bicarbonate of solaat 110° F. In older children, beneficial results sometimes follow the use of hismath subcarbonate (gr. x every two bours); but in infants we have seen but little effect from any form of medication, the reliance

being upon rest, eareful feeding, and stomsch-washing.

Cases of corresive gastritis require special treatment. The first indication is to administer the proper chemical antidate to the substance swallowed, and the next to use bland uncollaginous or oily fluids, such as milk, albumin water, tells in large quantities, etc. Especially should stomach-waching be avoided except immediately after the ingestion of the poison. Option is always required, on account of pain, and should be given hypothermically. The general symptoms are to be treated according to the indications of the infirtidual case,

CHRONIC GASTRIC INDIGENTION—CHRONIC GASTRITIS—GASTRIC CATARRIE

Although from a pathological point of view these conditions may not be identical, from a clinical standpoint there is no advantage in attempting to separate them. Nothing distinguishes chronic indigestion from chronic gastricts except that in the latter, in addition to continued derangement of function, there is a greater increase in the production of gastric mucus. Chronic indigestion does not long exist without the production of a certain amount of catarrhal inflammation. This condition in the stomach selflore, if ever, exists without more or less involvement of the intestine, and in the majority of cases the intestinal condition is the more important. In some, however, the gastric symptoms predominate, and it is only those which are here considered. What is often called chronic gastric indigestion in infancy has already been discussed in the chapter devoted to Difficult Feeding. In this connection only the condition as it affects older children will be referred to.

Etiology.—Chronic gastric indigestion may follow acute attacks, or it may be chronic from the outset. Etiological factors of importance are overfeeding, too large meals, unsuitable food, especially solid food too carly and in too large ameents for very young children. The condition generally accompanies dilatation of the stemach. As a consequence of imperfect digestion, fermentation in the residenm takes place, and the strituting products of this fermentation soon cause a catarrhal inflammation with a production of mucus. Chronic gastric indigestion also complicates trang of the constitutional diseases of childhood, especially rickets, syphilis, tuberculosis, and malnutrition. It may follow any of the scute infectious diseases. In older children it is often due to the habit of rapid cating and insufficient masticution, the cause of which is very often carious teeth. It may complicate valvular disease of the heart.

Lesions.—The changes found in chronic gastritis are usually confined to the mucosa. In the mild form there are degenerative changes of the spithelium of the tubules, with an increased production of mucus; there may be a slight infiltration of the mucosa with round cells. The more severe form, with marked cell infiltration and the population of new connective tissue, is extremely rare. The submucous cost may be thickered and the muscular cost attenuated. The lesion can not be recognized by the naked sye. The stemmen is upt to be more or less dilated, and its surface is costed with thick and very affected mucus. This lesion rarely exists alone, practically never in infancy, but is associated with similar lesions in the intestines, the latter often being more severe.

Symptoms.—In all cases the most constant symptom is vomiting, which may occur regularly after meals, or only in the morning before breakfast. If the latter, the somited matters consist chiefly of anices. In addition to these regular attacks there may be the frequent regargitation of small quantities of food. There are present gastric flatulence and pain, due to hyperacidity or to noid fermentation. The appetite is tariable—sometimes mordinate, constinues entirely lost; it may be capricious, there being usually a conving for highly seasoned food. The tongue is constantly furred, and the locath usually disagreeable. These symptoms are seen in all degrees of receivity. Intestinal disturbances are not frequent. Constipation is more commen than disarrhen. The general symptoms are those of malastrition. There are animals, wasting constant fretfulness, disturbed sleep, and various other nervous disorders.

Prognosis.—The prognosis depends upon the age of the patient, the duration of the disease, the surroundings, and upon fow well treatment can be carried out. There is little tendency to spanianeous recovery, but under favorable conditions, with constant care, much may be done for all these patients and many of them may be completely cured.

Treatment.—The general treatment is too upt to be ignored, but it is just as important as measures directed more specifically to the storach. A large, mony nursery, and pleuty of fresh air by night and by day, are very important; equally necessary are quiet surroundings and freedom from disturbing conditions which sometimes obtain in the nursery. General friction of the body is meful in delicate children with poor circulation. Of the measures directed to the stomach, two are cheefly to be depended upon—stomach washing and proper feeding.

Stomach-weshing is useful, first, in removing the macus which is abundant in most of these cases; secondly, in cleaning the organ thoroughly at least once a day, this of itself being most important; thirdly, as a stomalant to the gastric secretions, especially hydrochloric acid. Plain boiled water, or a weak alkaline solution—sodium bicarbonate, one drain to the pint—may be employed. In the early part of the treatment the washing should be done daily; later, every second or third day. The time selected is not very important, but it is better to make this about three hours after feeding.

With some children stomach-washing can not be easily employed, and other means must be used to clear the stomach of mucus. The best is undoubtedly the use of large draughts of water, as but as can be borne, an hour before eating. From six to eight ounces should be taken, preferably slowly by sipping. To this may be advantageously added, in many cases, fifteen or twenty grains of beauthonate of soda.

The diet should consist of diluted skimmed milk, whey, buttermilk, knows or molak, beef juice, rare meat, and a moderate amount of

starchy food, preferably dried bread or zwichark. All fruits should be accoded. All pastry, sweets, nots, and canches should be absolutely probabilited. With improvement in the symptoms green vegetables may be added to the diet, and the amount of starchy food increased. The amount of water taken at meal-time should be carefully restricted. Beneficial results are often obtained in these cases by the use of nex vonces or simple bitters before meals, and the regular administration of hydrochloric acid (gtt. v to viij of the dilute gold) shortly after meals. The general treatment must not be neglected. The patient should lead an outdoor life as much as possible, and should take regular but very moderate exercise. Great caution is necessary against overfatigue. Iron may be given in most cases during convalences; but cod-liver oil should be carefully avoided until the gastric symptoms have quite disappeared. Belapses are easily excited, and the most constant care regarding the food must be maintained for months, or even years.

DILATATION OF THE STOMACH

Moderate dilatation of the stomach is quite a frequent condition, although it is not so large a factor in the disconlers of digestion in infancy and childhood as many who have written upon the subject would lead us to believe. A very marked degree of dilatation is rare, but in these cases its recognition is important and its treatment difficult.

Dilatation is almost invariably regular or cylindrical; it is usually most marked at the cardine extremity. Cases of irregular or succular dilatation, except when associated with cicatricial conditions, are of very sure occurrence.

Dilatation may also result from reagenital stenosis of the pylorus. The most important predisposing cause, however, is the muscular alcoy which accompanies rickets. It is found to a slight degree in almost all severe cases of rickets. The principal exciting causes are continued distention from overfeeding and chronic indigestion.

In most cases the only symptoms are those of the chronic indigestion which almost invariably accompanies dilatation. The vamiling seen with dilatation is peculiar in that it is infrequent, possibly only once a day, but then the quantity vometed is larger than the last most taken. In young infants the pressure symptoms resulting from scale dilatation may be very serious. This is particularly true of those with scale branchitis or branchopnemically, or atelectasts. In such patients we have seen very grave symptoms accompany the rapid distention of a dilated stomach, and in one very delicate infant of three months this was apparently the cause of south. A positive diagnosis of dilatation is only

made by the physical signs. There is epigastric fulness and distinction, and in some thin patients the outline of the stomach can be distinctly seen. Dilatation of the transcerse colon, however, may be mistaken for dilatation of the stomach. In the latter, the lower outline is convex, while in the former it is usually slightly concave. The most satisfactory means of diagnoses is by pervission. The examination should be made three ar four hours after feeding, at which time the whole abdomen is apt to be tympunitic. The stomach should then be filled with water; the lower limit of the area of flatness will be the lower border of the stomach. This is much more satisfactory than determining the outline after the generation of gas in the stomach. If the lower horder comes below the unbilings, it may be assumed that the stomach is dilated.

In moderate dilatation of the stormed the prognosis is good unlessdue to pyloric stenosis. If the infant has any acute or chronic pulmonary disease, dilatation of the stormed may add to the discomfort and even to the danger from that condition. The distention of a dilated storach occurring in the course of any scate pulmonary disease should be relieved by the use of the stormed tube.

In the management of these cases the first point is to restrict the use of fluids, reduce the size of the meals, and regulate the diet in accordance with the general plan autlined in the chapter on Chronic Indigestion. If the dilatation is marked, the stemach should be washed once a day. The general condition of the patient usually requires tonics. Rickets, if present, should receive its appropriate constitutional treatment.

CLUER OF THE STOMACH

Ulceration of the stomach may be found in connection with several pathological processes which are quite distinct from one another;

 Ulcers in the Newly Born.—These have already been referred to in the chapters on Hemorrhages of the Newly Born. The only characteristic symptom is hemorrhage.

- Ulcers Resulting from Acute Gentritis.—These also are not frequent. As a rule they give no symptoms except these of gastritis, although in several cases we have known severe benerrhage to result from them. This symptom will be considered later.
- 3. Tuberculous Ulcres.—These are quite rare. We met with gastrie ulcers five times in one hundred and nineteen autopoies on tuberculous cases; however, the evidence was not conclusive in all of them that the olcres were tuberculous; but in three the tubercle lacilli were found. Usually there were several small obsers; in one case but two

were present, the larger one being nearly three-fourths of an inch in diameter, and aituated on the posterior wall near the middle of the greater curvature. All but one of these cases were in infants, one child being only ten months old. The ulcers gave no symptoms during life, and death took place from general interculosis. This is the history of nearly all the few cases on record. In one, however, reported by Casin, a toberculous ulcer perforated the stamoch and caused death from peritenitis.

 Simple Perforating Ulcers,—In young children these are of great rarity and uncertain pathology. Rotch has reported a case in an infant but seven works old, and Cade one in an infant of two months.

The symptoms of nicer before perforation are gastric pain and tenderness, somiting of blood, and often bloody stools. In most of these cases in children there were no symptoms until perforation; then followed collapse, sometimes high temperature, the rapid development of tympunites, and death from shock or from peritoritis.

The prognosis is had in all forms of ulcer of the stomach, except the small followlar variety. In this, however, the diagnosis can not positively be made except by gostric hymorrhage, and it is only this which

makes these cases serious.

Treatment.—The treatment is absolute rest, ice by mouth, small doses of opium, and restal feeding; later, bismuth, arsenic, or nitrate of silver. If symptoms of perforation occur the abdomes should be opened without delay, as offering the only chance of recovery.

DUODENAL ULCER

Until recently these uters have been considered very rare in infancy and early childhood, but the increasing number of cases reported, especially since 1998, indicates that it has formerly been overlooked. From a study of ninety-five cases in infants under one year collected from the literature by one of us in 1913, the conclusions which follow have been drawn.

Duodenal ulters are much more common than gastric alters; according to Entr they outnumber them for in one. Not a single instance of peptic alter of the atomach in infancy has been observed at the Babies' Hospital in twenty-series years. In but one case were doodenal and gastric alters found in the same patient, even including cases occurring in the newly born. Seventy per cent of the reported cases have been observed between the ages of six weeks and five months; about ten per cent occur in the newly born. The great majority of the cases have been seen in infants of the marrismum (atompted) type. In word of them there

has been also a lostory of provious digestive disorders. In several cases duedenal ulcers have been associated with spasm of the pylorus.

The most frequent site of the ulter is on the posterior wall of the dusdenom and practically all are above the papella. When but a single ulter is present, as is true of about two-thirds of the cases, it is nearly always situated just below the pyloric ring. These ulters are circular in shape; they have shelving, sharply defined edges, usually described as "punchedout" in appearance. At the base, blood sessels of considerable size are often seen. They may involve the nuccous membrane only, in which case they may readily be overlooked, or they may go to the muscular coat, to the peritoneum or they may even perforate. Microscopical examination shows almost complete absence of round-cell infiltration and other evidence of inflammatory reaction. The rest of the standenum usually shows a normal muccous membrane or one simply blood stained. Large elots or fresh blood may be found in the dusdenum or in any part of the small or large intestine. The stemach also may contain old or fresh blood.

The generally accepted view of the pathogenesis of duederal ulcers is that they are due to thrembosis followed by self-dipertion of the mucous membrane over a circumscribed area. The situation of the ulcers, above the papilla, indicates that the lesson is due to the action of the gastrie juice. Below the opening of the common duet the bile and pancreatic juice apparently protect the mucous numbrane.

Symptoms.-In over one-third of the recorded cases no symptoms suggestive of the condition were present, the older bong found at antopsy in patients dying from other mises. In other cases death occurs suddenly in collapse, sometimes preceded by symptoms of an ordinary gastro-intestinal disturbance and sometimes by none at all. In such cases the autoper frequently discloses senere ennealed hemorphage or performtion. If life is prolonged peritonitis may follow, but its recognition under these circumstances is exceedingly difficult since vomiting, fever and distention may all be wanting. Localized pain or tenderness in patients of this age is of no assistance to the diagnosis, though valuable symptoms in older children. The only definite symptom pointing to dusdenal ulcer is homorrhage. Blood may be vanished or passed in the stocks. In sixty-four cases of uleer reported with good histories, bloody stools were observed in twenty-right, bloody comiting in ten and both in six cases, four of these being in the newly born. Clear blood may be seen or blood changed by the action of the stomach or intestine. Once it occurs, hemorringe is apt to continue until the death of the patient, usually in twenty-four to thirty-six hours. The appearance of blood in any considerable amount in the stools of a young infant should always suggest drodenal ulter. Jaundice was a symptom in but one case in the series.

The diagnosis is made mainly by the presence of homorrhage from the

stemach or intestine, usually associated with collapse. Perferative peritonitis may be due to appendicate as well as aleer and both intestinal hemorrhage and collapse may occur with intrasusception. These should be home in mind as two conditions which may be confounded with duodenal aleer. Polypus and colitis must also be excluded. The prognosis of duodenal aleer at present is very had. The finding of build aleers at autopsy proves that recovery does sometimes take place, but it must be considered rare.

The treatment is purely symptomatic; on account of the present uncertainty of diagnosis, surgical measures are rarely justifiable.

TUMORS OF THE STOMACH

Although exceedingly rare, tumors of the stomach occur in childbood, and are seen even in infancy. A case of surcoust of the stomach in a child of three and a half years has been reported by Funlayson. It was apparently primary. The microscopical examination showed it to be of the spindle-celled variety. This writer could find no other recorded case under the age of fifteen.

Lymphodenoms of the stomach in a rachitic infinit of sighteen anoths has been recorded by Rolleston and Lathan. There were multiple tunnes arising from the mucous membrane in the pylone region. The case in many features resembled leukemin.

Six cases of easeer of the atomach in children under ten years are collected in an article by Otder and McCrao. Four of these were in young infants and probably congenital. One case, in a child of eight, presented the usual symptoms and lessons of the adult disease.

HEMORRHAGE FROM THE STOMACH (Homotomesis)

The most frequent variety of homorrhage from the stomach, that is seen in the newly born, has already been considered.

Serious and even Infal cases of gastric hemorrhage though extremely rare may be seen in older infants. The source of the bleeding may be small capillary hemorrhages from the mocous membrane, it may be from single or multiple ulcers of the stomach or more frequently from duodenal ulcers.

Hemorrhages from the stormen may occur in purpose, hemophilia, scurvy, and rarely in malaria. In young girls about puberty it may be a form of vicarious menotruation. Occusionally blood may be vomited in cases of hemorrhagic measles. Two cases are reported in which fatal hemorrhage followed the swallowing of a foreign body. In both, remiting of blood occurred long after the original accident. In one case two and a half years had slapsed. The autopsy in this case showed impaction of the fereign body and alteration into the arch of the aorta. Sparious homorrhages may occur when blood has been swallowed and then somited. The source of this is most frequently the nose or pharyus. It may happen in infants at the breast, when the blood is drawn from a fissure or alter in the nipple. The amount of blood romited under these circumstances may be large enough to be quite alarming. It may be recognized by the child's general condition being normal, and by the presence of fissures or alters upon the stepple. It may sometimes be noticed that the romiting of blood follows nursing from one breast and not from the other.

Symptoms.—There may be no symptoms except those of internal hemorrhage, but this is rare. Usually there is seniting of blood, and blood appears in the stools. If the hemorrhage is rapid and semiting specifily occurs, the blood may be of a bright-red color. If it has been long in the stoemeth it is of a dark-brown or black color resembling coffer-grounds. The stools containing blood from the stomach are black and tarry in appearance. The general symptoms will depend upon the amount of blood lost.

In a case where blood is comitted, the first point is to distinguish sparrises from true gastric hemorrhage. The nose and pluryns, especially its posterior wall, should be carefully examined. If the child is at the breast, the applies should be examined. In older children it is important to distinguish comitting of blood from hemophysis. This distinction is to be made in accordance with the rules laid down in text-books on general medicine. The prognosis is bad if the hemorrhage is due to above, if it is very profuse, or if it occurs in young infants. When it occurs in connection with constitutional diseases the prognosis depends upon the original disease.

Treatment.—Altogether the most efficient remedy is the suprarenal extract. It may be given very freely, at least two grains every half hour to a child of one year. The patient should be kept quiet, preferably upon the back; if there are signs of collapse, stimulants may be given hypodermically or by the rectum. No food or water should be given by the stemach for at least twenty-four hours after the hemorrhage has ceased.

THE SWALLOWING OF POREIGN BODIES

Between the ages of one and four years the bubit of swallowing foreign substances is a very common one. The variety of objects swallowed includes all those articles which the young child can reach and put into his mouth. The nest common are detached parts of toys, marbles, pelhles, buttons, and coins. Not only are such smooth articles swallowed, but also with equal readiness, sharp ones, such as pins of every variety, hits of glass, fragments of bone, mile, and small toy knives and forks, etc. At the time of swallowing, choking attacks, severe plaryngeal pain, and sometimes slight hemorrhage may occur. Symptoms referable to the esophagus are very few. Nor in the stomach are symptoms often excited. While passing through the intestine there may be colicky pains, but in the majority of instances there are no symptoms whatever even with sharp or angular looks. Impaction and perforation, while posible, are surprisingly rare. The usual time required for a foreign body to traverse the intestinal tract is from four to ten days, but it may be considerably longer. If the body swallowed is a smooth one, it passes the aphineter and without difficulty. But with sharp bodies there may be severe pain and sometimes hemorrhage.

The diagnosis is often a matter of much difficulty, and without an X-ray examination a positive diagnosis is impossible. Very often when the physician is called because this condition is suspected by parents the alarm turns out to be a false one.

It is most surprising to see the size, variety, and dangerous character of the foreign belies which pass through the intestinal tract without causing any symptoms whatever. The expectant treatment is therefore by all means to be recommended. No emetics or cathactics should be administered. The diet should be administered. The diet should be abundant and composed of articles of food which leave much residue, a g., coarse cereals, bread, and regetables. Must of all, operation should not be performed or even considered unless there are definite local symptoms.

Quite distinct from such accidental avallowing of foreign substances as has just been described, is the practice of pulling off and avallering for from rugs, wool from toys or blankets, shreds from clothing, and a great variety of other substances. This habit is usually seen in nervous children, and often in those where some gastric irritation seems to excite an abnormal craving. In infants the quantity of the substance is generally small and usually it provides vomiting or the material is specify passed by the bowel. In the Babies' Hospital a colored child of about eighteen months passed in one day a large mass of hair which she had pulled from her own head. Another child to the same ward pulled into shreds and swallowed a large portion of the fact of a cotton stocking, and passed the same by the bowel the following day. Such occurrences are not very common.

It occasionally happens that the substance scallowed does not pass the bowel but forms an intestinal tumor which may give vise to obscure and sometimes to swore symptoms of long duration. But more often the tumor forms in the stormich. These gastric tumors are usually composed of hair from the patient's own head. They are more frequently seen in adder children than in infants, and usually in garls on account of the long tair. Many of these patients are of the nervous type. The habit may continue until a tumor of considerable size may form, sometimes attaining two or three pounds in weight.

The symptoms of hair ball in the storage are vague until the tumor is discovered. There are usually gastric disturbances of a rather indicante character. Epogastric pain is common, but running is not especially marked. The general health may suffer but little for a long time. The tumor may be mistaken for cancer, a displaced sphere or tadasty, feeal impaction, or a tumor of the omentum. A correct diagnosis is seldom made until operation is done. In a few instances the tumor has disappeared after catharsis. If operation is done the outcome is almost always favorable.

CHAPTER VI

DISEASES OF THE INTESTINES

MALFORMATIONS AND MALPOSITIONS.

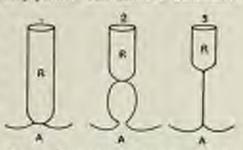
Maliformations are not very frequent, but are of great variety. With the exception of those situated at the lower end of the intestine they are not of much practical importance, for the condition is such ordinarily as to be incompatible with life. Malformations may be met with at any point in the canal, but most frequently in the rectum and anns. Ande from these, malformations of the large intestine are much less common than those of the small intestine.

Malformations of the Rectum.—In Fig. 22 are shown the usual varieties of malformation of the rectum. The most frequent is atresia of the same (1). In this the entaneous septum has not been absorbed, but the intestine is normal to its lower extremity. This form is readily carable by a surgical operation. In the next variety (2) the entaneous orifice and the lower part of the rectum are normal, but a membrane separates this portion from the upper part of the gut; this is usually situated within two or three inches of the area. The holging of the lower part of the fintended intestine can usually be felt by the finger in the rectum, and a simple division of the membrane by a guarded bistoury may referre the condition. The third form (3) is more serious. Here the rectum terminates in a blind pouch at a variable distance from the arms, and is represented below by an impervious fibrous cord. The

diagnosis of this condition can not positively be made without opening the abdominal cavity. The bulging of the intestine appreciable by the finger in the rectum, is the only point which differentiates the preceding variety from this one. Instead of atresia of the rectum there may be stensels of varying degrees, which may give rise to the usual symptoms of stricture. This is often camble by dilatation.

Malformations of the Small Intestine.—There may be stenois or afresis at any point, often at many points. Obstruction is much more

frequent in the upper than
in the leaver part of the
small intestine, the most
common sent being the doodenum. Alresis is more
often seen than stenesis.
There may be a single point
of obstruction, or the lumen
of the intestine may be obliterated for a considerable
distance, the intestine being
represented only by a fibrous



Fro. 27 Malermanicou or the Rictem. A. mare: R. restana.

cord which connects the two open pertions, or there may be no connection between them. In all cases the intestine above is found very
greatly distended, while that below is empty and usually strophied. The
causes of these multiple deformities are mainly two—fetal peritonitis
and volvulus. In fetal peritonitis there are usually found hands of
adhesions between the intestinal only, and between the intestine and
the solid viscera. Syphilis has been assigned as a cases in many cases.
Volvulus, or a twisting of the intestine during its development, is a
more satisfactory explanation of the majority of the cases, especially
when there are multiple points of atresia. All these conditions are
beyond the reach of surgical treatment. The symptoms appear toon
after both and are those of intestinal obstruction. The higher the point
of obstruction the shorter the duration of life; it is rarely more than a
week in any case of atresia; in stenosis it may be two or three mouths.

Meckel's Directiculum.—This is the remains of the emphalomesenteric duct, which in fetal life forms a communication between the intertine and the umbilical vesicle. It is given off from the florm, usually about a foot above the ileo-excal valve. Most frequently it exists as a blind pouch from one-half to two or three inches long, communicating with the intestine. At the extremity of this there may be a fibrous cord, which is free in the ablominal cavity or attached to the umbilious. In other cases the duct may remain pervious quote to the ambilious, so that there is a focal fistula. Prolapse of the muccos membrane of the duct may lead to an umbilical tumor, described elsewhere. Meckel's diverticulum, especially when present as a cord connecting the tlenm with the umbilicus, may compress a coil of intestine, leading to obstruction or some strangulation. This may occur in infancy or later in life.

Malpasitions.—The ascending color may be found upon the left side.

There may be a complete transposition of the abdominal viscers. In
cases of congenital unbillical herma a large part of the intestines may be
found in the tursor, and in disphragmatic hernia they may be in the
thoracic cavity.

DIARRHEA

The term distribut is used to include all conditions attended by frequent loose execuations of the bowels. These depend upon an increase in peristaleis and in the intestinal secretions.

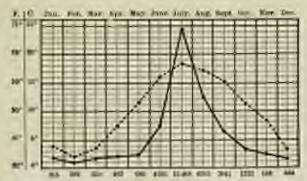
The importance of distribed diseases in children can best be appreciated by reference to the following table, showing the mortality of distributed disease in children under two years, as compared with that from certain infectious diseases for all ages.

Dooths in New York City for Five Years

Measler, all ages Scarlet fever, all ages Pertassis, all ages Typhold, all ages Diphtheria, all ages	3,378 4,153 2,000 3,533 10,277
Total deaths from five diseases.	23,335
District disease under two years	26,561

There are several important underlying factors upon which diarrheal diseases depend. Their greatest frequency belongs to the first year of life; and after the second year a notable diminution both in frequency and severity is seen, and a fatal outcome is relatively rare. The extreme susceptibility in infancy is due to several causes. The digestim organs are severely taxed to provide for the needs of the growing body. The mucous membrane of the gastro-enteric tract of all infants is very delicate in structure, and even in those with good health is exceedingly vulnerable. This vulnerability is enormously increased in the very young, and in those who are feetile, delicate, or suffering from any farm of digestive disorder. The mucous membrane of the digestive tract is furthermore constantly exposed to injury, either mechanical or chemical, and to infection.

Everything which lowers the general vitality increases the liability to diarrheal diseases. Chronic disorders of digestion, marasmus, malitatrition, and rickets are especially important factors. The most striking fact about diarrheal diseases is their prevalence during the summer season. This is graphically shown in Fig. 33, where are given by months the mortality records from this cause for New York City for ten years.



For III.—Mostratory runs Diagrams. Diseases by New York for The Years in Chicago Union Pres; Companie with the Many Tradenament for the Soon Parson. ———, mortality; -----, mean (emperature. Seibert.)

While diarrheal diseases are met with in all seasons they regularly increase with the advent of hot weather. In this country the higher summer temperature of the inland sities, Philadelphia and Chicago, is associated with a higher mortality from diarrheal diseases than is seen in Boston and New York with a lower range of temperature. Thus in Philadelphia and Chicago 32 per cent of the deaths under one year have been due to diarrheal diseases; while in New York but 27 per cent, in Boston but 19 per cent, and in London but 13 per cent have been from this cause. The large cities of northern Europe—London, Paris and Berlin—witness nothing like the mortality from diarrheal diseases seen in the large cities of the United States.

How atmospheric heat acts in causing discribed diseases is not yet entirely settled. It was long the prevailing opinion that it was the effect of heat upon the infant's food, especially the lactorial contamination of row's milk, that was the chief cause of discribes in summer. Without doubt thoroughness of neils inspection and the general use of sterilized milk in summer have materially reduced the nortality from this cause. But notwithstanding all the attention given to food there remains an enormous summer mortality from discribes. From the most recent study of this question the conclusion seems irresistable that heat itself has a direct, injurious effect upon the infant, and that it is not so much the outdoor temperature which counts as the stagment heat of spartments in which the infant lives night and day. The effects of heat are intensified by want of ventilation and all unlygicate surroundings. Heat under these conditions acts as a powerful depressant of the vital forces, disturbing metal-closm, causing indigestion and distribut.

Diarrheal diseases are especially seen in cities, for there are combined the conditions of poverty, neglect, but feed and but hygiene, all of which are important causes. That overcrawling and but housing in our large cities are not the chief factors is shown by the fact that the death rate from diarrheal diseases is often higher in smaller places, especially factory towns, than large cities. Thus in New York State it has been higher in Troy, Cohose and Newburgh than in New York City; and in Massachmetts, higher in Fall River and Lowell than in Boston.

Artificial feeding is an etological factor of the first importance. Less than 5 per cent of the severe cases of discribes are among the breast-feed, and fatal cases among the exclusively breast-feed are really rare, no matter how had the surroundings or how ignorant the mothers. Breast-feeding requires but little experience, and may be very successfully done even by those with a very low grade of intelligence and among the poor; but artificial feeding is not successful unless done with much intelligence and experience and also with good milk,

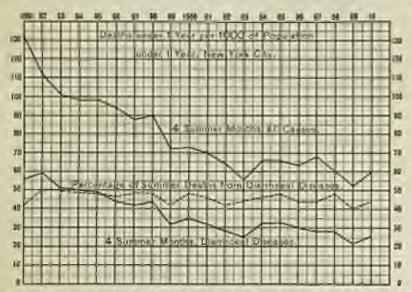
It is in factory towns, where the mothers work away from their homes and as a consequence breast-feeding is either not practiced at all or only for a short time, and where artificial feeding is usually badly done, that we see the highest mortality from diarrheal diseases. These conditions do not depend upon the size of the town and compared with them housing is of secondary importance.

Next to the kind of feeding as a cause of diarrhea must be placed gross or involuntary neglect or want of proper care. Ignorance and stupidity are large elements in the failure of artificial feeding among the poor. The simplest rules of hygiens are either unknown or ignored. The importance of cleanliness, fresh air, regularity and quiet is not appreciated. Under such conditions an infant, though often strong and bendity at birth, soon falls into a condition of malinatrition or marserus with such feedle resustance that he readily succurabs to the depressing influences of the first hot weather, the intestinal tract being the most vulnerable point.

But all the other factors mentioned—artificial feeding, overcrowding, but hygienic surroundings and reglect—exist the year round, yet diarrheal diseases are prevalent only in summer. We must therefore consider the direct or indirect effects of atmospheric bent as the primary exciting cause of paramount importance, the other conditions acting as secondary or oredisposing causes.

The rile of impure milk is so important as to demand further discussion; that it can couse distribut in infants is a fact that is established beyond question. We have seen every one of twenty-three healthy this dren, all over two years old, occupying one dormitory cottage, attacked to a single day with diarrhes, which was traced to this cause,

When the corresons barterial contamination of milk began to be appreciated, it was thought that in this was to be found the real cause of the prevalence and fatality of diarrheal diseases in summer. This belief carried with it the expectation that by furnishing to every artificially-fed infant a clean, fresh milk, or milk which had been pasteurized or sterilized, this great cause of infant mortality could largely be removed. It is true that a great reduction in infant mortality from



For 34.—Deares Union One Year sun 1,000 or Properties Come Year, New York Coty. A comparison of immer deaths from all causes with same-or deaths from distribut disease for a period of twenty years.

summer diarrheal diseases has been effected during the last two decades; but it is also true that there has been quite as great a reduction in infant mortality in other seasons, and, in summer, from other cancer than diarrheal diseases. (Fig. 34.) This leads us to question whether the bacterial contamination of milk is the great cause of diarrheal diseases, and whether the leavered mortality in summer has not been brought about quite as much by other conditions, such as better hygiene and care and a better understanding of infant-feeding, as by the exclusion of germs from milk or their destruction by heat.

In the years 1901 to 1903 an investigation ' was undertaken by The

[&]quot;The full report was published by Park and Helt in the Marical News, December 5, 1961.

Bockefeller Institute and the Health Department of New York to secure data regarding the following points: (1) The results in infant-feeding obtained with milk of different degrees of purity both in winter and in summer, as shown by the gain or loss in weight, the amount of gastrointestinal distorbance, and the death rate; (2) the relation, if any existing between the number of factoria present in the milk and the frequency of distributed disease; (5) 'whether any organisms with pathogenic properties could be found in milk to which distribute disease could be ascribed as a cause; (1) whether the practice of heating milk—pastrurisation or sternismism—affected the results obtained with any given milk; (5) to what degree other children as well as infants were affected by bacterial contamination of milk.

Observations were made upon 592 bottle-fell infants living in teasments of New York; 202 were observed in winter and 390 in summer. The infants were well when the observations were begun, and were watched for a period of about three months, being visited regularly by physicians. Samples of sulls as fed were frequently examined as to the number and character of the factoria present. Observations were possible upon infants taking (1) condensed milk, (2) the cheapest grade of store milk, (3) a better grade of milk delivered in bottles, (4) the best bettled milk sold in the city, all of the above being prepared at home, (5) milk moduled at milk stations and dispensed in separate feeling-bottles.

During the winter, the mortality was but 2.5 per cent, and in but one case was death due to disease of the digestive tract. The health of the infants observed was not approximally affected by the kind of milk nor by the number of bacteria which it contained. The different grades of milk varied much less in bacterial contamination in winter than in summer, the absorptions milk averaging only about 750,000 per c.c.

During the summer, the mortality was 10.5 per cent, four-diffin of the deaths being due to diarrheal disease. The worst results were seen in those whose food was either the cheup grade of store milk or condensed milk, and in those who received the powest care.

The number of bacteria which null may contain before it becomes noticeably harmful to the average infant in summer is not at all uniform. Of the usual varieties proceed, no strikingly deleterious results were seen until the number approached the one million mark. But much above this point injurious effects were usually manifest. Below it other factors seemed of greater importance in producing diarrhea. Thus in condensed milk the bacterial contamination was relatively small, yet the results were almost as ind as with the most highly contaminated milk.

No relationship sould be discovered between any special forms of bacteria present and the health of children or the occurrence of diarrheaTo test the effect of heating milk, observations were made during two summers upon 92 infants taking milk prepared at a milk station. It was from a good farm, and had been kept properly cooled. The infants were divided into two groups as nearly alike as possible. To one group the milk was given pasteurized (165° F, for thirty minutes), to the other group the same milk was given raw. All the infants were well at the leginning of the period of observation. The results are shown in the following table:

FooL	Number of Industria	Bonalise Well Exiles Famous	Hall Stores Diseries.	Average Days Diarries.	Death
Pasterried milk containing 1,000 to 50,000 bacteria per c.c. at the time of use.		31	10	4	T
20,000,000 bacteria per e.c. at the time of use.	51	17	34	105	2

Thirteen of the fifty-one infants on raw milk were changed before the end of the season to pastentized milk because of serious diarrheat, but for this the results with raw milk would have been even more unfavorable. A similar experiment was made a third season with almost identical results.

Although the number of cases is not large, the results, which were practically uniform for three successive among, show unmistakably that in hot weather raw milk, although from a good source, but at the time of feeding highly contaminated with bacteria, causes illness in a much larger number of cases than when it has been previously heated.

After the first two years, children are much less affected by hacteria in milk. The observations seemed to show that milk from healthy cows, produced under clearly conditions and kept at a temperature below 60° F., although containing large numbers of bacteria, sometimes amounting to many millions per c.c., might be taken in considerable quantities and for long periods by children over three years ald, without any approximately harmful effects. A single example is typical of a number of observations made. An orphan asylum, containing 650 children from three to fourteen years old, used during an entire summer milk in which the bacteria ranged from 2,000,000 to 20,000,000 per c.c.; yet during this period there occurred no case of diarrhen of sufficient severity to call a physician. The milk was kept cold, but was given without sterilination. More numbers of bacteria certainly appear to count for much less than was cone supposed. But the fact should not be overlocked that milk abounding in bacteria because of careless bandling is also always

liable to contain pathogenic organisms derived from human or animal sources.

These observations, continued for three seasons and giving each summer nearly identical results, indicate that we are to seek elsewhere than in a moderate bacterial contamination of milk the great ranse of summer diarrheas. Though it is clear that excessive furterial contamination is highly detrimental to infants, we must certainly look to the other factors for the explanation of a very large, possibly the largest, proportion of the cases. Of the other exciting causes, atmospheric heat, especially the stagnant heat of houses, is clearly first in importance. This may not by so interfering with normal digostion and metalolism as to lead to the formation within the body of injurious substances which excite diarrhea; or it may favor the excessive growth of becteria ordinarily present in the digestive tract. In this group of cases the rife of the luctures seems to be secondary, though perhaps a very important one. According to this hypothesis, the exciting cause of the diarrheas under consideration is not something introduced from without, but something produced within the budy itself,

From the foregoing discussion the measures to be employed in the prevention of discribeal diseases are inferred. In the order of importance they are as follows:

- Encouragement of maternal nursing and the adoption of measures to make this possible, particularly during the summer menths.
- Education of mothers in all matters relating to the care and hygiene of infants, best through the agency of the milk station and the visits of a trained district name.
- Adequate expervision of the milk supply, the general use of pasteurised or sterilized milk during the summer, and farmishing good milk to these too poor to pay for it.
- Instruction of mothers in regard to the care of milk in the home and in all matters of artificial feeding.
- The constant supervision of artificially-fed infants either in the milk station or by visits to the home.

The adoption of these measures and their application on an extended scale by an efficient organization has resulted in a very great reduction in the deaths from discribeal discusses wherever they have been tried. Nowhere have such results been achieved as in New York City, where the summer mortality in infants under one year has fallen in the Boroughs of Manhattan and Broox from an average of 1062 for the three years 1908-10 to an average of 802 for the three years 1912-14. (See Fig. 5. Chapter on Infant Mortality.) These figures represent the actual number of deaths and take no account of the increase in population. Another group of diarrheal discusses is seen which may be due to infection introduced from without, through water, milk, or other food; to these the term dynamicry is more often applied. These cases have been found to be associated with definite factoria or amelus. It is likely that intestinal discuss of this type may supervise upon other forms.

ACUTE INTESTINAL INDIGESTION AND DIABRIESA

The term intestinal indigestion is not an accurately descriptive one but is as satisfactory as any that has been proposed until more exact knowledge as to the cticlogy and pathology of the condition is available.

The cases included in this chapter comprise many types which, however, are closely allied and shade into one another. Though the extremes of the series differ as widely as possible, pet intermediate types of almost every grade are met with. They are discussed under a single heading, since they have no essential austomical differences, nor, so far as yet determined, do they differ chologically. Some of the attacks are so mild in character that in children with normal resistance, and receiving prompt treatment, they may last but a few boars. On the other head, they may be so rapid in divelopment and so server as to result in death in a few hours; or, beginning with loss intensity, they may be the starting point of prolonged functional disorders or may prepare the way for the development of infectious processes.

Etiology.—The most important causes have been recutioned in the foregoing discussion on the General Etiology of Diarrheal Discusses. A predisposition to attacks is furnished by summer weather, a delicate constitution, and any previous derangement of digestion. The exciting cause of an attack may be the use of improper food, overfeeding or some sudden change in food as in weating; but, the food remaining unchanged, it is often other influences affecting the child, such as summer heat. The most striking thing about these cause is their prevalence during hot weather. Year after year for generations have been repeated in New York the conditions which are graphically represented in Fig. 33, viz., an epidemic which, beginning in June, rapidly increases in accordy, reaching its height in July or August, from which time it dimmishes steadily, regularly coming to an end in September.

Despite the fact that since 1886 many series of hartericogical studies of the intestinal discharges have been unde by Boeker and by Park in this country, by Escherich, Baginsky, and others in Germany, our knowledge of this subject is still very incomplete. So far as is now known, no one form of harteria can be assigned as the cause of this group of diarrhous. There seems be be evidence that the Shiga bacillos may

produce diarrheal disease which clinically does not differ from this type. But it is wanting in so large a proportion of cases, that it can not be regarded as the specific cause. With existing knowledge it seems probable that there are a number of organisms present in the infestine in disorders of digestion, which, under favorable conditions, may multiply to such a degree as to produce serious disturbances; but the rôle of the microorganisms may be regarded as a secondary one.

There are certain cases in which symptoms of a severe type develop abruptly in shildren previously quite well. These only are to be regarded as examples of neate milk poisoning. Although the barteria in the milk may have been previously destroyed by starilization, the toxina produced by them may still be present. This is doubtless the suplanation of the simultaneous development of several cases in families or institutions.

We can not believe that direct contagion is the usual way in which this disease is spread. When occurring in institutions or in families, it usually happens that a number of children are attacked simultaneously rather than successively, this indicating a common cause, usually to be found in the fixed, the surroundings, or the atmospheric conditions.

The irritating substances producing the diarrhea are largely the lower fatty ucids. These are derived from the segar and fat of the food probably as the result of bacterial action. It is not the presence of absormal bacteria that brings about this result so much as the altered conditions under which they multiply and operate. These altered conditions may depend upon changes in the gastric, billiary, panercatic and intestinal so retices or upon other factors that we do not yet understand.

Lexions.—In the milder cases which end in recovery, the anatomical changes are probably negligible. In those which prove fatal from the disease itself, or from some associated condition, the lesions may be a superficial catarrhal inflammation affecting the entire gastro-enterotract, but varying much in severity in the different regions and in the different cases. Even after the most severe symptoms no lesions of consequence may be found.

The gross appearances may show but little that is abnormal. The walls of the stomach may be coated with mucus, and the mucus membrane may show congestion, generally in patches. The mucus membrane of the small intestine may be pale throughout; there are often irregular areas of congestion. With this there may be reduces and swelling of Peyer's patches and the solitary follicles. In the colon the nuccus membrane may be congested. The solitary follicles are usually swellen. The changes described are not at all uniform, and do not differ very greatly from the appearances often seen in the intestines when patients have died of other discusses.

In the cases classed clinically as cholern infantum, the pathological

changes are sometimes more characteristic. The greater part of the small intestine, and sometimes the entire colon, are distended with gas, and contain material of a grayish-white color about the consistency of a thin gruel. It has a mawkish odor, but usually not a very offensive one. The muccus membrane of the entire intestinal tract is in most cases pale. Sometimes this is only in the small intestine, while there are areas of congestion in the colon. If abolesa infantum has been engrafted upon some other pathological process in the intestines, as is not infrequent, there is found post-mortem evidence of this in the form of severe catarrhal inflammation, sometimes old ulcerations.

Unless autopsies are made very seen after death—at next within four hours—it is not safe to draw conclinious from the conditions found, as post-mortess changes take place rapidly, and resemble those of the disease under consideration. This applies particularly to the microscopical examination of the epithelium. The cells may still be present, but with the cell protoplasm and nuclei so changed that they do not stain normally. In more severe and prolonged cases the superficial epithelium in places is entirely destroyed.

The changes in and about the blood-ressels are variable. The small vessels may be distended, and there may be bemorrhages or an exudation of leucocytes in their neighborhood. These appearances are seen either in the nuncous or submiscous layer. Poper's patches and the lymph nodules may be enlarged from cell-proliferation.

The besions in other organs are less frequent and less severe than in the more protracted cases of descolitis. Acute branchitis and brancho-pasimonia are frequent. Acute degeneration of the kidney is found to some degree in every case which is severe enough to cause death, and in a few there is acute nephrals. The liver may be much enlarged and very fatty or of normal size, but degeneration of the liver cells is frequent. There may even be small areas of necrosis. In rare cases a general septicemia, due most frequently to the streptococcus, is present.

Symptoms.—Clinically, those cases may be divided into four groups:

(1) The mild form, with definite local symptoms, but few general case;
they may be of short duration or protracted; (2) the secore form in
which there are not only local but marked constitutional symptoms,
fever, etc.; (3) cholera infantum; (4) severe forms complicated by
acidesis.

The Mild Form.—In infants, the symptoms are solden limited either to the stomach or to the intestine, although in one case the disturbance of the stomach is slight and that of the intestine serious, and in another the reverse may be observed. In these little patients the intestinal symptoms are more frequent, and, as a rule, more severe than those referable to the assumatic. In other children it is not uncommon to see the intestical symptotes alone. In infants, if the attack develops suddenly, gastric symptoms are smally present; if more gradually, they are usually shoot. The local comptons are colicky pain, lympanites, and later diarrhea. The constitutional symptoms, prostration and pervous disturbances, are slight or absent. Pain is indicated by the sharp, piercing ery, great rectlesoness, and drawing up of the legs. Temperates is rarely very marked. The stools are always increased in number and are from four to bushe a day. If more frequent they are very small. The first stools are more or loss food, but this character is soon lost. The color is at first yellow, then yellow-slogreen, and finally often grass-green. This color is due to believed in. If the child has been taking milk, masses of undigested malk, shody fat, are present. The reaction of the stools is almost invariably and. The other may be sour, or it may be feel. The shools are much thinner than normal, and often frothy from the presence of game. Blood is not present, nor is much muchs seen, unless the symptoms have lasted several days. The microscope shows, in addition to food-remains, epithelial colls, usually of the cylindrical ratiety, which are numerous in proportion to the severity and duration of the attack. The bacteria are the ordinary forms found in the fees.

The source and termination of the disease depend upon the previous condition of the patient, the miliar of the exciling cause, and the treatment employed. In a previously healthy child, if the cause is at once removed and proper treatment instituted, the source symptoms rarely last more than a day or two, and in four or five days the patient may be quite well. In delicate infants, a source attack of acute intestinal indigestion in the hot scason is likely to prove the first stage of a pathological process which may continue until serious organic changes in the intestine have taken place. This result may not follow the first attack, but one is often succeeded by others until it occurs. If circumstances are such that proper dietetic treatment and general hygienic measures can not be carried out, this termination is very common.

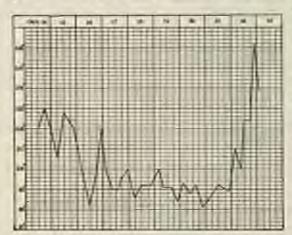
In other children most of the cases seen are of the milder type. The onset is often with vometing; pain is generally mild and precedes diarrhon by several hours. It is seidem localized but is more often referred to the masel. The shoels are losse, frequent, and contain undigested food, and are of almost every conceitable roles and variety. The temperature, if elevated at all, is so only for a short time. There is ansersia and a contest tongue. With proper treatment the attack is usually over in a few days. It is very seldem followed by the severer types of diarrhon, as is so commonly the case with inlants.

The Severe Form.—This may follow after several days of an apparently mild attack, especially during hot weather or if improperly treated. In the cases developing suddenly, the elinical picture is quite a definite one.

An infant is rectiest, cries much, sleeps but a few minutes at a time, and seems in distress. The skin is hot and dry, the temperature risks rapidly to 102" or 103" F., sometimes to 106" F., and all the symptoms indicate the sneet of some surious illness. He may be in a dull stupor, with eyes sanken, weak pulse, and general relaxation, or there may be restlessness, excitement, and even convolutions. There may be great thirst, so that everything offered is engerly taken, or everything may be refused. Vomiting may be an early and important symptom. It is first of food, often that which was taken many hours before; retching continues even after the stomach has been supplied, so that mucus, serum, and sometimes hile may be ejected. Vomiting does not usually persist throughout the attack, and in many cases it is absent altogether. Diarthen is sometimes deligned for everal bours after the beginning of the grave constitutional symptoms. At first there are fecal stools, then great bursts of flatus, with the expulsion of a thin year, a material with an offensire odor. Four or five such discharges may sever in an many hours. At other times the stools are gray, green, or greensh-yellow, and sometimes become. The characteristic features are the amount of gas expelled, the colicky pains preceding the discharges, and the fool odor. After the first day the stools may be almost entirely fluid, varying in number from six to twenty a day, and often large even then; but their offensive character frequently disappears. After two or three days muchs appears. The microscopical examination of the stools shows great numbers of separate epithelial cells, and sometimes groups of cells attached to a basement membrane. In addition there may be leucocytes and some red bloodcorpuseles.

In many cases the free exacuntion of the bowels is followed by a drop in the temperature and subsidence of the nervous symptoms, and the shild may fall asleep. The prostration, though often great in the beginning, may not be of long duration. In the most favorable circumstances, after one or two days of severe symptoms, convalencence may take place. The stools continue frequent for five or six days, but gradually assume their normal character, and recovery follows. The chief factors contributing to such favorable results are a good constitution on the part of the child, prompt and intelligent treatment at the autset, and proper feeding afterward.

If the circumstances are not so favorable, if the patient is a very young or delicate infant, there may be no reaction from the first severe symptoms, and the attack may tremmate fatally in from one to three days. In such cases the temperature remains high; the stomach may or may not be disturbed; but the duarrhea, prostration, and nervous symptoms continue, and death occurs from exhaustion, in come or convulsions. Instead of a rapidly fatal termination, the severity of the early acute symptoms may abute somewhat, and the attack assume the character of ileocolitis, with a lower but continuous temperature of 160° to 102° F., frequent macous stools, wasting, etc. The urine is aganty and concentrated, and in most of the arrore cases with very high temperature contains a small amount of albumin, and occasionally a few



Fro. 35.—Sevent Intermedal Intermetric with Farial Bunaria: Indust five months old, only symptoms, both interitial and nervous, sower, rapid improvement followed scopping milk, five outhance and impution. After stools had from marily normal for three days relapse occurred, apparently from adding milk to the diet, although less than two cancer a day were given. Autopsy: Only sold intestinal belong were present, other organs succettally normal.

hyaline and granular easts. These are the result of degenerative changes in the renal epithelium. In rare cases there are exidences of acute rephritis. Brouchopnessments is sometimes seen.

It not infrequently happens, after the steem of the arute attack with its high temperature, intense prostration, and grass nervous symptoms is pussed, and the stools are so much improved that the patient is regarded as out of dangor, that all the

former symptoms may develop with such rapidity and severity as sometimes to carry off the patient in from twelve to twenty-four hours. Such relapses are generally excited by some matrice in the dict, usually that of allowing milk too soon. The amount of milk given may be small, and yet the symptoms follow its administration so soon that there can be little doubt regarding the connection between them (Fig. 35). Besides such severe cases, many milder relapses are seen; the cause is usually some error in dict.

Attacks of acute intestinal indigestion with severe constitutional symptoms in which there is at first no discretes, but constipution instead, are most puzzling and frequently serious. Fortunately, they are not of common occurrence. It is somewhat difficult to explain such cases. There acems to exist for the time almost complete intestinal paralysis. The lock materials are locked up in the small intestine, for the colon is frequently quite empty. When one meets such a case he can appreciate the fact that diarrhes is a conservative process of the greatest possible value.

In children over two years old there are seen some features which differ from those of the cases above described as securring in infants. The attacks are more eften due to other casses than to milk. Vomiting does not occur so readily as in infants, pain is a more prominent symptom, and the temperature, as a rule, is lower. The nervous symptoms are much less prominent. Skin eruptions, however, are more frequently seen, particularly urticaria, which is a feature of many attacks, and in obscure cases has some diagnostic value. Although often beginning with severe symptoms, these cases usually make good recoveries; there is much less danger of repeated attacks or of the development of ileocolitis than in the case of infants.

Cholese Infantum.—This is only one type of the severe form of acute indigestion, yet clinically it differs from the others sufficiently to deserve separate consideration. It is not, however, a frequent form. What it is that determines the marked and characteristic symptoms in cholera infantum is entirely unknown.

Cholera infantum rarely occurs in an infant previously healthy. As a rule, there is some antecedent intestinal disorder. The development of the choleriform symptoms is usually very rapid, and a child, who perhaps has been regarded as scarcely ill enough to require a physician, may be brought, in the course of five or six hours, to death's door.

Usually there are general symptoms, such as prostration and a steadily rising temperature, for a few hours before the vomiting and purging, or these symptoms may be the first to excite aform. Vomiting may precede diarrhea, or both may begin simultaneously. The comiting is very frequent. First, whatever food is in the storach is vomited, then serum and mucus, and sametimes there is regargitation from the small intestime. If wemiting subsoles for a time, it is almost sare to begin anew with the taking of food or drink. The stools are frequent, large, and fluid, and may occur once or twice as hour. They are of a pule green, vellow, or brownish color in the beginning, but as they become more frequent they often lose all color and are almost entirely accous. The sphineter is sometimes so relaxed that small evacuations occur every few minutes. The first stools are usually acid, later they are neutral, and when serous they are alkaline. In most cases they are odorless; in rare instances they are exceedingly offensive. Microscopically the stools show large numbers of epsthelial cells, some lencocytes, and immense numbers of lacteria.

Loss of weight is more rapid than in any other pathological condition in childhood; it may be as much as a pound a day. The fentanci is depreced, and in rare instances there may be overlapping of the cranial bones. The general prestration is great almost from the outset. The tree, better, perhaps, than any single symptom, indicates what a prefound impression has been made upon the system. The eyes are sunken, the features sharpened, the angles of the mouth drawn down, and a permisar patter with an expression of anxiety corresponds the whole countenance, which becomes almost Hippocratic. In the early stages the nervous symptoms are those of irritation. Later, these symptoms give place to dolores, stoper, relaxation, and counter convulsions.

The temperature is invariably elevated, and usually in proportion to the severity of the attack. In cases recovering, it has generally been from 102° to 103° F., while in fatal cases it has risen almost at once to 104° or 105° F., and often shortly before doath it has reached 100° or over 108° F. Such temperatures may occur with a claiming skin and cold extremation and are discovered only with the aid of a thermometer. The pulse is always rapid, and very soon it becomes weak, often irregular, and finally almost imperceptible. The respiration is irregular and frequent, and may be electorous. The tongue is generally control, but soon becomes dry and rod, and is often protraded. The attenues is generally soft and sunlow. There is almost insatiable thirst, Everything in the shape of fluids, especially water, is drunk with axidity, even though maniful as soon as it is swallowed. Very little urine is passed, semetimes none at all for twenty-four bours; this largely depends upon the great less of fluid by the boucks.

In the fatal cases there is hyperpyrexia, a cold, clammy skin, absence of radial poles, stoper, come or convulsions, and death. The diarrhes and remitting may continue until the end, or both may entirely cause for some hours before death occurs. The patients may pass into a condition resembling the algor stage of epidermo cholera, and die in collapse. In other cases, after the first day of very severe symptoms, the discharges diminish, but the nervous symptoms become specially prominent. There is notlessness and irritability or apathy and stupor. The fontand is sunken; the eyes are half spen and covered with a muccus film; respiration is irregular and superficial, sometimes even Cheyra-Stokes; the pulse is feeble, irregular, or intermittent; the muscles of the neck drawn back; the abdomen retracted. The temperature is not stevated, but normal or subnormal. From this condition recovery may take place or the symptoms may merge into those of disconline; but much more frequent than either of the foregoing is the fatal termination.

The nervous symptoms have been secribed to cerebral anema, cerebral hypercenta (tensus), colona of the meninges, thrombosis of the cerebral sinuses, and ovenia. Although we have examined the brain in almost all our autoposes upon patients dying from diarrheal diseases, we have never in such cases seen sinus thrombosis, and but rarely edema. Cerebral hyperemia is often met with in cases dying in convulsions, but not with any regularity otherwise. Nor have our observations upon the kidneys confirmed those of Kjellberg, when must of the writers since his day have quoted, as to the great frequency of nephritis. A scanty, concentrated, and hence irritating urine is the rule, and a small amount of albumin and an occasional hyaline cast not uncommon; but either clinical or pathological evidence of a serious amount of nephritis has been, in our own experience, extremely rare.

An infrequent complication of cholera infantum is selerems. This condition is found associated with muscular contractions, subnormal temperature and other signs of the most extreme depression. These cases are almost invariably fatal.

Of the children with true cholers infantum which have come under our notice, fully three-quarters have died.

Acidesis.—In the course of the severe form of diarries or of cholera infantum, symptoms referable to the nervous system and respiration may appear. There may be excitement and sleeplessness with a frequent, shrill, piercing cry. Later on there may be sommelence gradually increasing to stupor or even come. The type of respiration is the most characteristic evidence of acidesis. This is altered so that there is an increased ventilation of the lungs, i. e., exaggerated inspiration and expiration. This is often difficult to recognize in its early stages, but frequently develops into a marked dyspines of the "air hunger" type, without purse or symmetric and without any evidence of obstruction. There is often a polymorphenuclear lencocytosis, generally between 20,000 and 30,007. There may be sugar in the urine which, if factors is given in the food, is said to be galactose and factore, or sancharose if this sugar is being taken. There are in addition the symptoms of severe general prostration.

When such symptoms are present, especially the nervous and respiratory ones, the condition is very grave. The majority of the children with manifest hyperpassa dis, although life may be prelouged for several days. Though the hyperpassa may cease as the result of treatment, death resulty occurs; for many abnormal processes at present not understood have undoubtedly been initiated and are sufficient to cause death.

It is to the train of symptoms just described that the name "find intestication" (alimentare intestication) has been given by Finklestom. He claims that this condition is the result of the presence of products of intermediary metabolism, imperfectly claborated, and that they are directly poiseness. Evidence of their presence is, however, lacking.

Recent studies have shown that in these cases there is an aridosis, that the disturbances of respiration are referable to this condition, and that the gravity of the symptoms is probably dependent directly upon this acidesis. It has been shown that accompanying the hyperpura there is a low carbon dioxid tension in the alscolar air; that the greater the hyperpura, the lower the carbon liouid tension; that in the most severe forms there is an increase in the hypergensian concentration of the blood serum; that there is a great diminution of the alkali reserve of the blood and that a greatly increased quantity of alkali can be taken before the urine becomes alkaline. Socia becarbonate, given by menth, intravenously ar subcutaneously, causes a resistion of the hyperpura and a return of the alkalimity of the blood to normal. This furnishes a definite indication for treatment. But the relief of the acidosis does not necessarily cure the diarrhea. There is no doubt that there is an alteration in the normal relation between the acids and alkalies so that the former are in relative covers. What causes this alteration is not known at the present time. It is not due, as a rule, to an excess of the acctone bodies. These are but moderately increased in amount.

Diagnosis.—The neute gastric and intestinal symptoms which mark the beginning of many febrile diseases in infancy, particularly the cumthemata and presumonia, are often difficult to distinguish from the more severe attacks of acute indignation with constitutional symptoms. The question to decide is whether the dignative symptoms are the cause or the result of the fever. It is sumetimes not until the case has been watched for some time that one can be certain. Usually when dignative symptoms are secondary they diminish after the first day or two, although the severity of the general symptoms may steadily increase. The characteristic features of the primary disease may also appear. When the recent symptoms of the severe form of scute indipaction are preminent at the outset, it is sometimes difficult to exclude meningitis. We have seen many cases where great doubt existed for several days. One should always healthe to make a diagnosis of meningitis when marked diarrhes is present.

Prognesis.—The milder forms of scate intestinal indigestion do not often prove fatal, except in young infants or those already suffering from malnutrition. In all cases the prognesis depends upon the previous health of the child, his surroundings, the season of the year, and whether or not the case receives prompt and proper treatment. Severe forms of the disease, especially those associated with nervous or respiratory symptoms, are very serious. A continuously high forer is a bad prognestic sign. The existence of rickets, pertussis, or any other disease, greatly increases the gravity of the attack. True cholera infantum is nearly always fatal.

Prophylaxia.—A better understanding of the etiology brings with it great possibilities in the presention of this discuss.

Prophylaxis must have regard, first, to the hygienic surroundings of

children, and to all sanitary conditions of rities. City children should be sent to the country, whenever it is possible, for the months of July and August. Where a long stay is impossible, day excursions do much good. The fresh-air funds and sesside homes have done much in New York to diminish the mortality from diarrheal diseases.

The second part of prophylaxis relates to food and feeding. Maternal nursing should be ancouraged by every possible means. Nothing is better established than the close relation existing between artificial feeding and diarrheal diseases. Yet, as stated elsewhere, it is not artificial feeding per se but ignorant and improper feeding. Among infants in private practice who are properly fed these attacks are not common.

Overfeeding is particularly to be avoided during days of excessive heat. It is at such times an excellent rule with infants to diminish each feeding by at least one-half, making up the deficiency with water, and to give water very freely between the feedings. In summer all water given to infants or young children should be beiled. Children, like adults, require less food in very hot weather, but more water. Infants cry more from thirst and heat than from honger, and even those at the breast are likely to be given too much food. Infants should never be fed more frequently, but always less frequently, during hot weather.

A very important work in practical philanthropy among the poor of our large cities in summer is to provide means for supplying pure milk to infants. This has been done on a large scale in many American rities, and it is one of the important agencies that have effected a decided reduction in the death-rate from distribud disease. It is not enough to furnish to the poor a pure, clean milk in bulk, or even in scaled quart bottles. The advantages of such milk may be entirely lost by the way in which it is cared for in the home or the way in which it is fed to infants. Since the milk must usually be kept at home without ice, sterilimition is advisable. When milk is distributed from milk stations, a physician should be in charge who can keep a general supervision over the children, and advise as to the quantity of feed, number of feedings, and the formula to be used. His work should be supplemented by visits of nurses to the homes of patients. An essential feature is to keep such close supervision over the infants as to recognize at once and promptly treat alight disturbances of direction.

But even more important than pure milk is the education of the poor in all matters relating to infant feeding and hygiene. In no way can this educational work better be done than in connection with milk distribution.

Hygienic Treatment.—If the attack is a source one and occurs in the excessive heat of midsummer, and does not readily yield to treatment, the child should, if possible, he sent to a cooler place. Convalescent cases

should also be sent away on account of the dangers of relapse. Children must not only be sent away, they must be kept away until quite recovered. In cases which have become somewhat chronic, more can sometimes be accomplished by a change of air than by all other means,

Fresh air is of the utmost importance for all diarrheal cases in summer. No matter how much fever or prostration there may be, these children do better if kept out of doors the greater part of the day. Children should be kept quiet, and especially should not be allowed to walk, even if they are old enough and strong enough to do so.

The clothing should be very light flamed; a single losse garment is professible. Lines or cotton may be put next the skin if this is very sensitive and there is much perspiration. At the aushors and in the mountains, care should be taken that sufficient clothing at night is supplied. Bothing is useful to allay restlessness, as well as for the reduction of temperature. Scrupulous cleanliness should be secured in the child's person and clothing. Napkins, as seen as rolled, should be removed from the child and from the room and placed in a disinfectant solution. Exteriations of the buttocks and genitals are to be prevented by absolute cleanliness and the free was of some absorbent powder, such as starch and baric acid.

Dietetic Treatment.—It is of the first importance to remember that during the early stage of the neutr cases, digostion is practically arrested. To give food at this time, manifestly can do only harm.

In nursing infants the severe forms of the disease are extremely rare; but the breast should be withheld so long as a disposition to venit continues, and no fool whatever given for at least twenty-four hours. Thirst may be alloyed by giving frequently, but in small quantities, boiled water or thin barley or rice water or weak tea sweetened with sarcharin. If these are refused ar vanited, absolute test to the stomach will do more than anything else to hasten recovery. After the stomach has been allowed to rest for twenty-four hours, it is generally safe to permit a nursing child to take the breast tentatively. The intervals of nursing should not be shorter than four hours, and the amount allowed at one feeding should not be more than one-fourth the usual quantity. This may be regulated by allowing an infant to nurse at first only two or three minutes. Between the nursings may be given boiled water or barley water. Nursing may be gradually increased, so that in three or four days the breast may be taken exclusively.

In infants who are being artificially fed, all food, and especially milk, should be stopped at once. Sweet milk should not only be withheld during the period of neute symptoms, but for several days thereafter. Besides the articles mentioned above as suitable for the period of most neute symptoms the following substitutes for milk will be found useful: rice or barley water, the farinaceous foods, and broth or benillon made of veal, chicken, mutton, or best. Water may be allowed freely at all times unless there is much vomitting.

When milk is begun it should be remembered that the sugar is more likely to disturb digestion than any other element and that sugar and fat together are very badly bome. For this reason some form of fermented milk, buttermilk or proton milk is to be preferred. This latter may be given except to the most severe forms of the disease and except when remiting is marked, almost from the beginning of symptoms. After twenty-four hours of preliminary starvation, if the symptoms are very arute and after cleansing of the intestinal tract has taken place either from the diarries itself or from cathartics or irrigations, its use may be began. It has a marked effect in counteracting the diarrhea and is well herne by almost all infants except those under two or three months of age. At first the protein milk should be given in small amounts, one or two conces every four hours, and to infants under six months of age diluted with an equal quantity of water. The increase in amount and in strength should be gradually made according to the improvement in symptoms. No sugar should be added until a day or two after the stools have become quite firm in consistency and not more numerous than three or four a day.

The sugar should be one of the dry preparations containing maltose such as dextrimalione. Solution's subremeker, Liebig's subranitase or rane sugar. Lactose should not be used. The sugar should be added very gradually, beginning with one-quarter sunce a day and increased up to four or five per cent of the Icol. If loose stools result the sugar should be discontinued. A return to sweet milk should be made gradually and with caution. To this no sugar should be added until it has been demonstrated that the diluted milk can be folerated. Wet-nurses are not to be employed during the acute symptoms, but during the period of prolonged malnutrition which follows an acute attack they may be of the greatest service.

The same general principles of feeding should be applied in older children. All food is to be withheld until the voniting ceases, when broths and thin graces may be given; later, buttermilk, knows and protein milk. Junket from which the whey has been carefully strained is very useful in checking diarrhen. Solid food should not be allowed for several days after the stools have become normal.

Medicinal and Mechanical Treatment.—It must be forme in mind that we are not treating an inflammation of the stomach or intestines, although such may be the ultimate result of the process. The essential condition, it should be remembered, is one of indigestion and intoxication arising from the intestinal contents—food-remains from arrested

digestion, altered secretions, acids, irritating and toxic substances produced by chemical and barterial action—to which not only the constitutional but the local symptoms are cheefy due. We can hardly do better than to imitate and assist Nature in her treatment of this condition. Let us consider what this is. Lest too much food be swallowed, appetite is taken away; by comiting, the stomach is emptied; to neutralize the acid poissus in the intestine, an alkaline serum is poured out from the intestinal walls; to remore irritant poissus, increased peristables is excited.

The first indication is, therefore, to exacuate the stomach and the entire intestinal tract at the earliest moment. Unless thorough evacuation of the bowels has taken place, treatment should not be begun with the use of measures to stop the coclearges. To empty the storach is not necessary in every case, since the initial vomiting may have done this effectively. If vomiting persists one may resett to stormen-washing A single washing is generally sufficient, and if employed at the embet may shorten the attack. With high fever and great thirst, it is often advisable to leave a few sunces of water with ten to fifteen grains of hiearbonate of soda in the stomach. As a substitute for stomach-washing in children over two years old, or where it can not be employed, espices draughts of boiled water may be given. This is taken readily, and as it is usually remited almost at once it may cleanse the storach thoroughly, If there is distention with fever and foul stools, sutharties are indicated, but if the diarrhea has been profuse cathartics should not be employed. There is no greater mistake than to think that the character of the stools is likely to be improved by calomel or custor sil. The stools contain little if any fecal matter; what is passed by the bowel consuts almost entirely of inhestinal secretions.

To clear out the small intestine, only ratherties are available. For the colon, we may in addition employ irrigation. Calomel, easter oil, or the salines may be used as catherties, and enough of any one of them must be given to clear out the intestinal tract thoroughly. Calomel has the advantage of case of administration: one-fourth of a grain should be given every fifteen or twenty minutes up to four or six doses. When the stomach is not disturbed, cause oil is to be preferred as it is not so irritating, causes little griping and is very certain. Two drams should be given to a child six months old, and half an onnee to one of four years. Of the salines, the best are the sulphate of sods and Rochelle salts; from one to three drams may be given, well diduted, divided into four or five doses, at twenty-minute intervals.

Cathartics may be employed later in the disease if the stools become foul or there is distention, but care should be taken not to continue to irritate a hypersensitive intestine. Early irrigation of the color is advisable in all cases, as it hastens the effect of the cathartic and removes at once much irritating and offensive material. It should be done two or three times the first day, but afterward once daily is generally sufficient. A saline satution (one table-specified of salt to two quarts of water), at a temperature of about 100° F₊ is to be preferred; and a rectal tabe well inserted should always be used. Thorough initial evacuation, no food, but plenty of water for twenty-four hours, and careful feeding after that time, are all the treatment that is necessary in most cases.

Other drugs are of secondary importance. Their value is certainly very much everestimated. It is very doubtful whether as yet any proper

antiseptic treatment of the gastre-cuteric tract is possible.

Of the drugs which are used to influence the intestinal process, hismuth is to be preferred. It has the advantage that it rarely causes vomiting, and that most of its perparations can be given in large doses. The subcarbenate is the safest. It may be given in doses of from ten to twenty grains every two hours, to a child of one year. Like the subnitrate it is insoluble and is best given suspended in the food or in water. It usually blackens the steels. It may be kept up throughout the attack. Our experience lends us to place little reliance upon astringents. They do little good, and often much harm.

While opium in some form is required in many cases, it is capable of doing much harm. The chief indications for spinm are great frequency of movements and severe pain. It is contraindicated until the intestinal tract has been thoroughly emptied; also when the number of discharges is small, particularly if they are very effensive; it is especially to be avoided in the early stage of very acute cases, and never to be given when cerebral symptoms and high temperature resents with seanty discharges. Opinm is admissible after the tract has been thoroughly emptied. It is particularly indicated when there is a persistence of large, fluid movements attended by symptoms of collapse, and in all cases approaching the cholera-infantum type. Nothing requires nicer discrimination than the use of option in diarries. It is wise to administer it always in a separate prescription, and never in composite diarrheal maxtures. The dose should be regulated according to its effect upon the number of stools. Enough is to be given to produce a distinct effect -the control of excessive peristalsis and the dimination of pain-but never enough to check the discharges entirely, or to cause stayer. The uncertainty of absorption must also be remembered; a second full door should not be given until a sufficient time has disperd for the effect of the first to pass away. For an average child of six months, ten minima of paregorie, one-half minim of the doctorized tincture, or one-half grain of Dover's powder, may be used as an initial dose, to be repeated energy one, two, or four hours, according to the effect produced. In severe cases it may be necessary to increase the dose considerably. When argently required morphic should be given hypodermically, one-sixtisth of a grain to an infant of six months, to be repeated in two hours if no effect is seen.

Stimulants are often required in severe cases. The prostration is great and develops rapidly; frequently almost no food can be assimilated for twenty-four or thirty-six bours, while the drain from the discharges continues. The general condition of the patient is the best guide as to the time for stimulation and the amount required. Brandy is the best preparation for general use. An infant a year old may, as a maximum, take half an conce of brandy, well diluted, in twenty-four hours. Caffein and camphor may also be given. While the use of stimulants is indicated in many cases their effects are disappointing. Taken by mouth they are frequently semited. It is then necessary to give caffein and camphor hypodermically. In cases of extreme prestration and collapse the hot bath, mustard to the extremities and sometimes the mustard pack are beneficial.

When acidesis is present as indicated by dyspnea of the "air-hunger type" or by laboratory tests, alkalies, especially bicarbonate of sods, should be given by mouth, intravenously or subcutaneously. Enough should be given to render the nrine alkaline and to keep it so. As there is a greatly incressed telerance for alkalis the amount required may be large. With a normal infant the administration of fifteen grains of binarbonate of sods is sufficient to render the urine alkaline. With acidosis six or eight times this amount may be required. It should be given in doses of lifteen to thirty grains every two hours. If vomited, it should be given subcutaneously or intravenously. The latter method is preferable if the injection can be made through the skin without exposing a vein. As much as 50 e.e. of a four per cent solution of sodium bicarbonate may be given at a time. If a vein can not be found, the selntion may be injected subentaneously. This method has the disadvantage of requiring a solution " which is somewhat difficult to prepare and even with all precautions sloughing may result from its use. The injection should be repeated with sufficient frequency to maintain the urine alkaline.

The early evidences of acidosis are difficult to recognize clinically; it is, therefore, safer to give soda in all severe cases of intestinal indiges-

[&]quot;The solution is prepared by sterilizing a four per cent solution of carbonate of sods. The being emissing it is necessary to transform it to the binarbonate by possing carbon though from a Kipp generator or a cylinder through the cold solution until it is colorless to phenolphthalem. It may then be used. Buletisss of bicarbonate cannot be sterilized without decomposing.

tion in quantity sufficient to maintain an alkaline reaction of the urine.

With the severe form of the disease, especially in the cholera infantum type, the great drains of water and salts from the blood may in itself be serious.

Varieting is usually present which prevents the giving of water by mouth; enemata are not retained. It is therefore necessary in many cases to give water subcutaneously. This may be given by hypodermoelysis as described elsewhere in amounts varying from six to ten ounces daily. The birarborate of code solution mentioned above may be employed or simple saline solution of a strength of eight-tenths of one per cent. These injections should be repeated until the constion of vaniting allows sufficient water to be taken by mouth. Their beneficial effect is frequently striking. Glucose in three-per-cent strength may be added to the saline solution but in the majority of instances the sugar content of the blood is within normal limits or even abnormally high. Except in prelonged cases therefore the addition of glucose does not seem to be indicated.

CHAPTER VII

DISEASES OF THE INTESTINES .- (Continued)

ACUTE ILEXCOLITIS-DYSENTERY

(Enterocobilis; Enteritis; Informatory Diarries)

There been illuscribits is a general one, embracing those forms of intestinal disease in which true inflammatory lesions are present. In the types of cases described in the previous chapter nothing more than superficial changes seem, while in ileocolitis the pathelogical process continues until there have been produced marked lesions, often involving all the walls of the intestine. Sometimes it is impossible, by symptoms, to draw a line between them. This is especially true of the cases terminating in follicular abcration of the colon. In certain other forms of fleocolitis the evidences of a severe intestinal inflammation are often manifest from the very cateet. This difference is probably due to a difference in the character of the infection. The extent of the lesions depends much upon the duration of the process.

Etiology.—The predisposing causes of the colities are those common to discrete discover in general, and have already been considered. Although seen with expectal frequency in summer, and in children under two years old, it may affect those of any age, and occurs at all seasons

Epidemore are not uncommon in the early fall months. While usually primary, ileocolitis often follows infections diseases, especially measles, diphtheria, and bronchopteumonia. It frequently occurs, in institutions chiefly, as a terminal infection in infants suffering from extreme malnutrition or marasmus. All other forms of intestinal disease are predisposing causes. The question of contagion is unsettled; if at all communicable, it is feehly so. When it occurs epidemically a common origin seems more probable than that the disease spreads from one patient to another.

The only harterium that up to the present time has been proven to be capable of producing this form of intestinal disease is the B. dynesterior of Shiga. This organism, or, more properly speaking, this group of closely allied organisms, has now been found in all parts of the world in a sufficient number of cases to establish its etiological connection with ileocolitis. The B. dynesterior was shown by Shiga, in 1898 and 1809, to be the cause of spidemic dynestery in Japan. In 1900, Flexuer established its association with tropical dynestery in the Philippines, and in 1902, David and Bassett, pupils of Flexuer, demonstrated its presence in a series of cases of diarrhea in children at Baltimore.

This organism is very frequently found in cases showing blood and imposes, or much imposes in the stoods. Although usually the B, disenterias is greatly outnumbered by other organisms, it is not uncommon to finiit in pure culture. A number of minor differences have been found in the facilit from different cases; there are, however, two main groups, the division being made by reason of the difference in reaction with hitmus mannite; one group is known as the "true Shiga," or "alkalise" type; the other, as the "acid" type," which has been most frequently found in the discretes of shill-from in this country, although the true Shiga is occasionally present, and in rare cases they may be associated.

Whether the B. dysexterias is present in normal stocks of builthy children is still unsettled. Wellstein at the Babics' Hospital failed to discover its presence in the stocks of 56 normal infants. The B. dysexterias has never been found outside the body; we are therefore entirely ignorant both of its habitat and its mode of entry. There are grounds for heliening that it appears at times among the saprophytic hacteria of the intestinal contents.

The rôle played by other bacteria, especially the streptococcus, in the production of the deeper lesions of the intestine may be an important one. This appears, however, to be rather in the nature of a accordary invasion; but the streptococcus is found at times in such overshelming numbers that it is considered by some authorities to play the chief part

[&]quot;The "acid" type includes the Flexner-Harris, the "Y" type of Him and Burrell and the Strong (Manch) subvarieties.

in the production of the leatens. The gas bacillus of Welch, the harillus precyazens and the other organisms occasionally found in the stock are probably of accidental securrence.

Lesions.—It is surprising that, so far as is known, a single organism can excite such a variety of besions. The nature of the anatomical changes apparently depends upon other factors, such as the intensity of the infection, the local resistance, and still more upon the duration of the disease. The association of other organisms must also be considered.

The nature of the lesions in ileocolitis differs greatly, but their position is quite constant; they affect the lower ileum and the colon. In about half the cases only the colon is affected. The besides of the ileum are usually limited to the lower two or three feet.

Acute Cutarrial Rescalitio.—In the milder cases there is infiltration of the mirrors. In the severer cases the subminosa is involved, and the infiltration of the mirrors may be so great as to lead to necrosis and the formation of ulcers.

While the lower ileum and the colon are most seriously affected, it is not uncommon to find quite marked changes in a considerable portion of the small intestine, and even in the stormely. In the cases of short duration, the besions are sometimes more marked in the small intestine than in the colon. The mucous membrane is often coated with tempcious nurs and may appear somewhat swellen. Congretion is a constant feature; and it may be simply upon the folds of the mucous membrane, or about the solitary follicles, or it may be intense and involve the whole intestine for some distance. Small bemorrhagic areas are often seen here and there, widely scattered. In the most severe cases there are marked thickening and uniform congestion. The solitary follicles throughout the color are usually swollen, projecting above the muons membrane and about the size of a pin's head. Poyer's putches may be normal, or they may be swollen and congested, or, more rarely, they may be involved when the rest of the mucosa appears healthy. The lymph nodes of the mescatery are neually avollen and acutely congested.

In interpreting the microscopical changes found in the mucosa, the same precautions must be observed as stated in the precises chapter. There is usually loss of the superficial epithelium and of that being the inbular glands at their orifices. The lumen of the tabular glands is narrowed from pressure due to the swelling of the tissue which separates them, which is partly from edema, and partly from cell infiltration. A thick layer of mucus and round cells, adhering cloudy to the surface, may recentile a pseudo-membrane (Fig. 16). The superficial portion of the nucosa may be infiltrated with round cells and crowded with bacteria of many kinds; the depth to which this infiltration extends depends upon

the security and direction of the process. In very severe cases there is found a dense infiltration of the mucous and of the submucous also, which in places extends quite to the muscular cont. The lymph modules of the colon are swellen to a greater or less degree, chiefly from an increase in the number of lymphood cells. This swelling may be the most prominent feature of the lesson. If the process is sufficiently prolonged, the lymph nodules may levak down and alcemate. The changes in the lymph nodules of the small infectine and in Peyer's patches are similar to those seen in the colon, but are less teacked, and are frequently absent about the colon. For example, the small seins

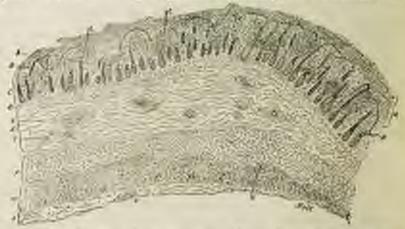
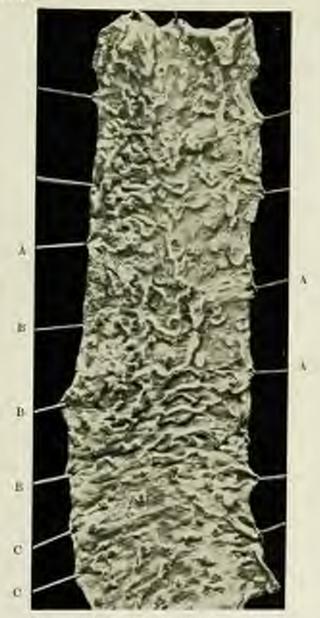


Fig. 36.—Actyrz Caramman Invacements of the Invest: Spream Form. The motion C, is everywhere densely indirected with small refle, compressing the industrialities and in places, L, L, planest effecting them. E-poin the surface of the masses is a thick layer of cells and materia. Security their the spatialist needed, R, according the oil may be seen. The lesions are almost emissly of the materia. The only charges in the submissions, E, are groups of cells about the small blood-remely, V. V. History—figured six months oil; moderate distribut twelve days; severe symptoms with high temperature for an days. There was informe inflammation of the entire color and lower these feet of the class. Intestine groundy competted and thickened. Specimen is from the therm.

and capillaries of the mucesa and submucesa are usually distended with blood; small extravasations are very common, and occasionally larger ones are seen.

Catarrial inflammation, except in its very severe form, which is not frequent, causes no lesions that can not readily be required. The most persistent change is usually the swelling of the lymph nodules, which may last a long time. There is often pagmentation which may occur as strine in the nuccous membrane but which is more frequently limited to Peyer's patches and the solitary lymph nodes. Under the microscope there may be found more at less cell inditration of the nucesa, but rarely any destructive changes or new connective tissue.



EXPENSION SUPERFICIAL United at the Concept Control of the Concept Control of the Control of the

Founds child nine mouths old: symptoms of nearesticondition of them days' densition; femperature, 2017 to 201 Fr., and from an in make study shifty—this, grown, and yellow, but no blood.

Extensive electration throughout the roles, must marked in decending parties, from which specimen is taken.

A.A. are small circular alone; B.R. laters care from conference of me and of these; C.C. large areas of observation, the macross name beam being almost retirely destroyed.



Calcerbal Indiamention with Superficial Ulteredies.—In the most severe form of catarrhal inflammation which does not prove fatal in the earlier stages, extensive alceration occasionally takes place; assumily these alcers are seen throughout the entire colon, and occasionally a few are found in the lower ileum. They generally begin in the mucesa overlying the lymph nodules, and while they have a wide superficial area, they do not extend deeper than the mucesa. The small alcers are circular and usually show at the center a small granular body—the lymph nodule. The larger alcers result from the confessions of several small ones, and are irregular in shaps. They may be two or three inches in diameter. Sanstines for a considerable distance a large part of the mucesa may be destroyed. Often the entire surface presents a worm-saten appearance. (Plate V). On microscopical communication there is seen, in the greater part of the alcer, complete destruction of the mucesa, the submicroscopical destruction of the mucesa.

Informeration of the Lymph Nodules—Folliesian Ulteration.—Folliesian alcers are found at autopsy in about one-third of the cases dying from diarrheal diseases. They are rarely seen in those which have lasted less than a week, and not often before the middle of the second week. The average duration of the disease in these cases is about three weeks.

In thirty-six cases in which followlar obers were found at natopsy, they were present in the small intestine alone in but three cases; in the small intestine and in the colon in six cases; in the remaining twenty-seven they were present only in the colon. When in the small intestine they were seen only in the lower ileum. Ulceration was seen a few times in one or two of the nodules of a Poyer's patch. Ulceration of the large intestine involved the whole colon in about half the cases; while in the remainder the process was limited to its lower portion. The deepest and also the largest ulcers were usually in the descending colon and algoroid flexure.

In the early stage these olders appear as tiny excavations at the summit of the prominent lymph nodules. Later, the whole nodule may be destroyed, and a small round where is formed from one-twelfth to one-fourth of an inch in diameter (Plate VI). Those are quite deep and have overhanging edges; when closely set they give the intestine a sixulike appearance. By the coalescence of several of them, larger of may form which are an inch or more in diameter. At the bottom of these larger ones the transverse strine of the rireular muscular cost are often plainly seen. Perforation is extremely rare.

Microscopically the lymph metales appear swallen, principally from the accumulation within them of round cells. This is followed by softening, which usually begins at the summit of the medule and extends downward; the reticulum breaks down, and the cellular contents escape into the intestine (Fig. 37). Softening may begin at the center of the module, which ruptures like an abscess. The destruction of the whole nodule leaves a cavity, which is the followard alone. At first the ulcer corresponds in size to the module, but infiltration of the adjacent tissue soon takes place, which may become necrotic. In this way the alone extends chiefly in the submucous coat. The lesson is raror limited to the lymph nodules; but the extent of the other changes found depends

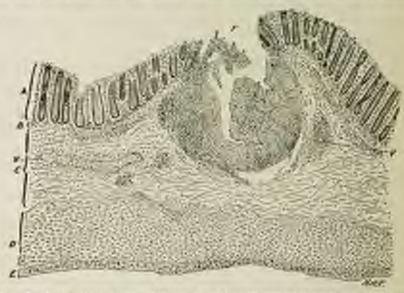
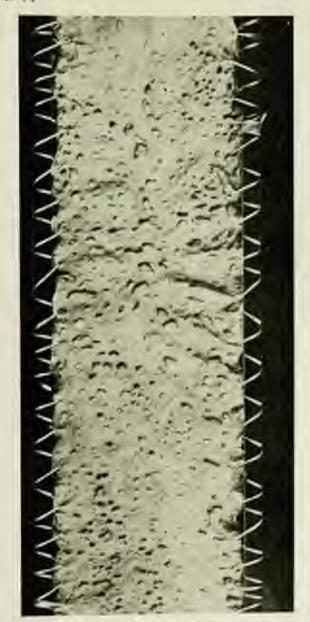


Fig. 27.—Livers Newton or yes Union as wer Exect Sensor or Union the Following Liver. The module, F, is much enlarged, and is breaking down and discharging take the interties. The taker charges are not marked. The aspectical epithelian is gone; the museum, A, shows a slight increase of sells, and in the subsequence, C, or mets of sells interties the small remain. U, V. Mintern.—Deficiely which, thirteen months old; slight distribution four works; severe symptoms five days. The solon was tiled with alrest one-twelfith of an inch in dispector, one of which is shown in the Hantzmann.

upon the severity and the duration of the process. In cases fatal after an illness of a week or ten days, we usually find only moderate changes in the muccou, and in the submuccou,

Follieular ulceration of the intestine in infancy usually terminates fatally if the process is an extensive one. In less severe cases recovery may take pince, the ulcers healing by granulation and contribution in the course of from four to twelve weeks. It is very doubtful whether stricture over results from these ulcers in children. Among the very rave lesions are cysts of the colon that are produced by dilutation of some of the tubular glands whose crifices here been obliterated.

ACUTE MINISTERANCES ILEOCOLUTES.—This is the most severe form of intestrual inflammation seen among children. The most frequent type



DEEP POLICEMENT PROFITS OF THE COLOR.

A delicate cital, feartous months old, sick matter days; should green, pollow, basen, and waters I no blood; temperature, 100° to 101° F.

The small intention was necrosit offers throughout robus. The specimen is from

descending roles, the alvers are deep, and most of these sevend to the repender cost



of membranous celitis is that with sovers acute symptoms, both constitutional and local, with a duration of from an to fearteen days. In young infants its symptoms and course are very irregular, and it may be found at autopsy when no serious intestinal lesion has been suspected.

Gross Appenduces.—There is visible to the naked eye usually very little pseudo-membrane and no deep aloughing. The lesion affects the last two or three feet of the ileum and the entire colon, smertimes only the colon. It is exceedingly rare to meet with any marked lesions higher in the small intestine. The most marked changes are near the fleececal



Fig. 38.—Denor Foreignman Union or two Cotics. A deep bleet is shown at F, a smaller one at F. The separation of the macross at H is accidental. There is no trace of the lymph nodule from which the large effect had at origin. The destructive passess has extended intendly in the submacross. C. and the macross. A, is hilling in to fill up the space. In the vicinity of the afternoon, the submacross is densely indicated with resses cells L*, L*, which also are seen in the lymph passes between the bundles of circular materials fibers, L*, L*, and sense are seen in the lampitudinal massesher cost, L, L, Hidden,—Thereon materials distinctly continuous distribution symptoms for three weeks. Unless found throughout the colors, the largest, one-hall an inch in discenter. The Hamiltonian above one of the small same like those in Flate VI.

raive or in the sigmoid flexure and the rectum. In the ileum they may be quite as severe as in the colon (Plate VII). The intestual wall is firm and stiff, and is two or three times its normal thickness. It is not thrown into deep folds, as is the healthy intestine when empty. It is very rare to find false membrane that can be stripped off in patches of any considerable size. When membrane exists, the color is a yellowish or grayish green, and the surface is often fissured, giving a lobalated appearance. In the parts where no pseudo-membrane can be seen, the surface is usually of an intense red color and is rough and granular, in striking contrast to the normal glistening appearance. Here and there small extravasations of blood may be seen. In the regions most affected, the normal structures of the mucous membrane—the villi, Peyer's patches, and solitary follicles—can not be distinguished. Except in the

forcer floors the small intestine shows no constant changes, and none are smally found in the stomach.

Microcoptest Changes—These (Fig. 39) are much more uniform than the gross appearances. The most characteristic feature as the exmission of fibrin, which forms a distinct pseudo-membrane upon the surface of the intestine; it may infiltrate the mucosa, and even the submucosa. Fibrin is seen under the microscope in parts of the specimen, which to the naked eye show no distinct pseudo-membrane, but only a



For the—Minima work became row or min Conor. The investing is severed with a psycho-moralizate, M, which is compained chiefly of granular filters, the masses, A, is foundly justled with round yells, and the mituliar follotic have almost disappeared, traces only being left, at T, T. The voltaments, C, is greatly thickened, partly from only but shiefly from Shain, which with a high power is seen to be everywhere in this cost, as well us the missions. Notes of order are seen to the massalar mate at L, L. At F is a lyingh module revered by pseudo-membrane, but broking down at its center. F, T, are small blood-symmic with mate of cells should have seen and the center of cells should have containing blood. Lesions bound throughout order and in lower flows. Intesting greatly thickened. Specimen is bloom according colon, where feeding weren.

granular appearance. In rare cases a fibrinous exudation may be found upon the persistent covering of the intestine. The pseudo-membrane is made up of a fibrinous network containing small round cells, some red blood-cells, and numerous bacteria. The mucosa, and usually the submucosa, are densely infiltrated with small round cells, which in places may be so numerous as to efface the nermal elements of the intestine. The tubular follicles are in some places quite destroyed, not a vestige of them remaining. In other places they are compressed and distorted by the accumulation of cells. The great thickening of the intestine is due

partly to the tell infiltration, partly to the farmous exudation, and partly to ofems. All the blood-vessels, both in the muress and sub-mucosa, are gorged with blood, and many small extratasations are seen. A mecrotic process with the formation of deep ulture we have never seen associated with membraneous colities.

Associated Leniane of Reccolitis.—The most important one is bronchopneumonia. It is found in quite a large proportion of the protracted cases, and not infrequently it is the cause of death. There is no evidence that it is due to an infection from the intestine, although such a thing is possible in septicense cases. Pulmonary tuberculosis is not infrequently met with in hospital cases, having no relation to the intestinal disease. Peritonitis is infrequent. We have met with it but once or twice, and then it was localized and of the plastic variety. Inflammations of the other serous membranes—pleuricy, pericarditis, and messagitis—are all tery rate.

The renal lesions of ileocolitis have been the subject of considerable discussion, some observers holding that nephritis is a frequent complication of the severer forms of discriben, while others have held it to be rare. The lesions that we have usually found coincide with those described by others, and consist in marked degeneration of the epithelium of the tubes with but few glumerular or interstitial changes. Acute diffuse nephritis is a very infrequent though sometimes a most serious complication. The lesions mentioned as usually present are properly classed as acute degeneration rather than as inflammation of the kidney. Degenerative changes may be found also in the beart number, the liver, spleen, and even in the central nervous system.

Considerable attention has been given to a study of the blood in intestinal inflammations, to determine how frequently and in what circumstances a general blood infection (septicemin) from the intestines occurs. In the great majority of the cases studied under proper precautions the blood is sterile.

Symptoms.—(1) Catarrial Cases of Moderate Security.—The onset is usually saidless, often with comiting, and for twelve, sametimes twenty-four hours the symptoms may be those of scate indigestion: comiting, pain, fever, and frequent, thin, green or yellow stools, which are partly feval and contain undigested food. Later the discharges contain blood and massus, are often preceded by pain and accompanied by innomus. The stools are very frequent, often every half hour, and proportionately small, sometimes less than a tablespoonful being tomos upon the mp-kin after severe straining efforts. The massus may be clear and jelly-like, or it may be mixed with focal matter. Blood is seen in some cases in almost every stool, but rarely in clots, usually streaking the macus. These stools are almost colorless. After a few days the blood usually

disappears, or is seen only as traces in an occasional stool; but mucus is stall present in large quantities. The color of the discharges now becomes dark brown or brownish-green. Prolapsus and is frequent, and may occur with nearly overy stool. Abdominal pain is present, and is often quite intense just before the stool; frequently there is tenderness along the colon. For the first twenty-four hours the temperature is usually high, from 102° to 104° F. During the greater part of the attack it ranges from 50° to 102° F. There is considerable prostration; the loss is weight is usually marked and continuous; appetite is lost; the longue is contest and the general appearance of the children indicates serious illness, although no really grave symptoms are present. Convalencements always slow, and it may be mouthly before the lost weight is regained.

In the milder cases the symptome point to inflammation of the lower part of the colon only. The constitutional symptoms are not at all marked. The temperature may not be above 1917 F.; the forgue may remain alean and the appetite good; the child may be bright and active, and hardly seem at all till, and yet have from six to eight mucous and

bloody stocks a day.

The duration of the acute symptoms is usually two weeks, and yet in such cases, even though the child was previously in good condition and properly treated, recovery is slow. The first symptom of impresement is generally the disappearance of blood from the stocks, which at the same time become less frequent, and the pain and tenesions cears, Gradually the stocks assume more of a feral character, but mucus is likely to persist for two or three works; it may be seen in all stocks, or only occasionally. In some cases both the mucus and blood disappear and the stocks become thin, brown, or green, like those of an ordinary diarrhea. Relapses are readily excited, but cases such as have been described are rarely fatal except in delicate infants. This is the most our mon form of decoditia which terminates in recovery.

(2) The Severe Centerchal Flora,—This form of theocolitis, like that just described, is usually primary. The symptoms closely resemble those of the membraness variety, and a diagnosis from it is in most of the case quite impossible. The most rapidly fatal case we have sen fastal only three days, but the usual duration is from one to two weeks. The temperature is steadily high; the stock continue very frequent and generally contain blood; there is great prostration, dry tengue, series on the lips and teeth, and prominent servers symptoms. Death usually seems from exhaustion and profound sepais while the acute symptoms are at their height. If the patient survives this stage, the case may drag on for four or five weeks with a temperature curve much like that of typhoid forer, and then terminate in recovery or in death from slow.

netheria, bronchopneumonia, or from an arate exacertation of the intestinal symptoms. The autopsy in such cases usually reveals the presence of superficial alexes. If recovery is to be the extense, after the symptoms have been nearly stationary for a long time, there is seen a gradeal improvement first in the general and then in the local conditions. Convalencence is very slow, often interrupted by relapses, and it may be months before the patient is quite well.

(3) Fallicular Ulcarotion—Ulcarotics Informacion of the Nobeles,—Follicular ulceration is often preceded by other forms of intestinal disease. It is much more frequently not with in infants over six months of age. The great majority of those affected are institutional children or those who are in poor condition at the time of the attack.

To understand the symptoms of these cases, it must be remembered



Pag. 40.—Temperature Causer or Lescourres. Persi, no Twiner sources Day. Autopsy showed following above throughout the colon.

that follicular electation is often a terminal process following other forms of diarrhea. It may be preceded by one or more acute attacks, or by a protracted subscute attack. On account of the feeble resistance of the child or the continuance of the saciting cause, the pathological process gradually extends to the lymph nodules of the intestine, chiefly the colon, which, as already described, pass successively through the stages of swelling, softening, and electation. The enset of the illness may therefore be abrupt, with coniting and high fever; or gradual, without somiting and with very little fever.

Vomiting is not a feature of these cases; but it is often present at the smet. Throughout the attack it is easily excited by injudicious feeding or medication. The temperature is solden high, except at first 1 its axial range is from 95° to 101° F.; toward the close, even of fatal cases, 0 may be scarcely above the normal. The accompanying shart (Fig. 40) is a very good illustration of the course of the temperature in cases beginning abruptly and ending fatally.

The stools are seldom very frequent, the number being from fear to eight a day. The most constant feature is the presence of mucus, which is mixed with the stock and usually abundant. Blood is not generally present, and a large amount of blood is extremely rare. Large bemarrhages from ulcers we have never seen. The color of the stock is most frequently dark green or brown. Fluid stock are seen only during exacerisations. The oder is usually offensee, particularly in postructed cases. The microscope shows epithelial cells in great numbers, and very often an abundance of small round cells, which may be looked upon as the most constant sign of ulceration.

The Influre in nutrition and steady loss in weight are very constant. in these cases. As emariation goes on, the skin hangs in loose folds on the thighs; it becomes dry and scaly and boos its elasticity, and occusionally small petechial spots are seen upon the abdomen. The skin over the author's becomes excernated, and hed-some form over the heals, the sucrum, or the occiput. The abdomen may be moderately distended, or it may be related and self. Tenderness is not usually present. The appetite is lost, and in nest cases great difficulty is experienced in inducing children to take a proper amount of nourishment. Occasionally, when there is fover, fluids are taken engerly. A returning appends is always an encouraging sign. The mouth is often dry, the tongue coated, sometimes dry and beawn; there may be surdes upon the lips and teeth. Superficial ulcers form upon the muccos membrane of the mouth, and often thrush is seen. The nrine is usually diminished, high-colored, and loaded with urates. Albumin and easts are occasionally present. Barely is nephritis severe enough to be a factor in the result. Tenesmus and prolapere ani are uncommon.

The usual duration of the fatal cases is three or four weeks, but may be very much longer; their course is often marked by exacerbations and remossions. If preceery takes plans, convalescence is always very slow and

relapses are easily excited,

Very few of these cases recover completely. Even these who survive the primary illness are likely to suffer from intestinal symptoms for many months. Fatal relapses are often brought on by injudicious feeding when the children are apparently almost well. The general health is usually so undermined that the patients continue to suffer from all the symptoms of malnutritiess, and ultimately succumb to an attack of some intercurrent acute disease.

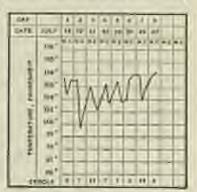
The diagnosis of ulceration is to be made from the case as a whole rather than from any special symptons. If a delicate infant, who has previously been propose to diarrheaf attacks, has given mucous stools with low fever, and these symptoms continue with unabated severity for two or three weeks, ulceration is probable. If such symptoms continue for three or four weeks with steadily failing strength and loss of weight, the diagnosis is almost certain. If, on the centrary, after three or four days of acute symptoms there is improvement in the stools and scrasionally some which are quite focal in character, even though it may be a week or more before the mucus disappears, we may be quite certain that no ulcers have formed.

(4) The Membrasous Form.—This is the gravest form of inflammation of the intestines seen in children, and its symptoms are more often obscure than are those of any other variety. This is particularly true when it affects young infants. There may be at the orset and throughout the course of the discuss severe level and constitutional symptoms; se with well-marked constitutional symptoms, the local symptoms may

be slight or of very doubtful character, so that it is often mistaken for some

other disease.

In the first form it closely resemides the most severe cases of enturrhal inflammation. The discuss begins abruptly with counting, high temperature, and several large, fluid steels. The remiting does not often continue after the first twenty-four bours. The temperature is at first from 102° to 103° F, and its course may be steadily high (Fig. 41), or remittent. The abdomen is often tender and semetimes swollen. There is severe pain, and at



Pin II - Temperature Chart or Meannances Course, Paras.

times tenerans, with prolapse of the rectum. This is seen to be intensely congested, and sometimes shows patches of pseudomembrane upon its surface, thus establishing the diagnosis.

The shools often resemble those of the enterrial variety, except that blood is more constantly present and usually more abundant, but the only positive point of difference is the presence of shrols or flakes of pseudomembrane. If the stools are thoroughly washed with water those may be seen as small gray equique masses, which are then easily distinguished from the transparent nature. Large shrols of membrane are seldom seen in children. Both blood and mucus sometimes disappear from the stools, which may consist only of dirty water. Under the microscope there may be seen epithelial cells, red blood-cells, and round cells in great numbers.

The presence of corebral symptoms in these cases of membranous seconditis may lead to great obscurity in the diagnosis. This is most frequently true at the onset. There may be high temperature, great prostration, comitting, stoper, delirious and even convolution; and such symptoms may for two or three days completely mask the intestinal condation. As the case progresses, however, the intestinal symptoms come more and more into prominence, and the cerebral symptoms usually subside. But sometimes this is not the case,

Membraness celitis is also obscure when it affects young infants. The preminent symptoms are, rather high, continuous temperature, usually ranging between 101° and 100° F., but following no distinct curve (Fig. 42); wasting, which is not rapid but progressive; frequent steels, which have no constant or striking observementies. They are usually thin, pellow or grownish in color, often containing no mucus or blood. Occasionally for a day the stools may be almost normal in appearance. In number they average five or six a day, but often for days only two or three. Outside of a hospital shore autopoins are regularly

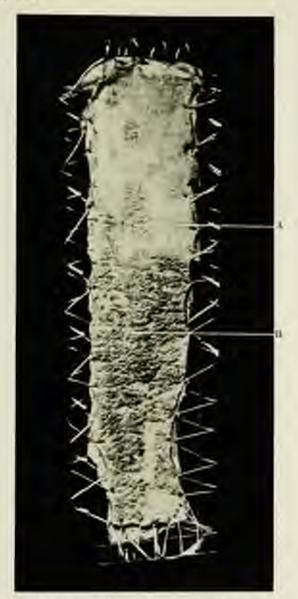


For \$2.—Transmirrors Course or Massauscone Course. Infant fraction secules old Europe Massauscone for the first two weeks obscure. Intential symptoms for the first two weeks obscure. Intential symptoms for the first two weeks only, never very severe; stools four to six daily, presently given, this, with much increase at times, and once or better traces of blood. Autopey: No lease, of importance except membranous coldin involving entire colon; a slight material ententia.

made these cases are smally overlooked and considered as obscure presuminia, toberculous, septicemia, typhoid, etc.

The duration of membraneus ileocolitis is usually from one to three weeks. Death takes place from sepsis, exhaustion, or from complications. It is probable that almost every case of the severity described terminates fatally when it occurs in an infant. In older children the prognosis is much better as to life, but in them the acute attack may be followed by the chronic form of the disease.

Diagnosis.—Herselitis is to be distinguished chiefly from typhoid fever, intersusception, and miningitis. Typhoid is distinguished by the slower invasion, more constant temperature, enlargement of the sploen, tymposites, and most of all by the Widal reaction and the eruption. Arms colitis should not be confounded with intersusception; yet the records of intersusception show that a very large proportion of the cases were regarded in the beginning as cases of dysentery. In intersusception, although there is a sudden onset with acute pain, tenesmos, romiting, and marked prostrution, there is rarely fever. The later symptoms



MEMPHONES INFLORMATION OF THE BOOKS

A delicate shild, eleven months slid; sold discribes for two works without fevery nearly severe symptoms for twelve slaye; temperature, 190° to 102 3° K.; green and mucous stools; so the of

The balous igestred the last fact of Benn and entire volon. Specimen is from lower fleurs, and shows the atolast termination of the losine: the upper part flower termination of the losine: the upper part flower termination of the losine: the upper part flower termination of the intention; it has a rough granulus approximate and in much thickened.



-abeliate constigution, turnor, storcomerous consiting, and collapsehave nothing in common with colitis. The membranous form may be confounded with meningitis, and in assec cases a differential diagnosis is impossible except by lumber puncture. Marked diarrhen, even though the stools are not characteristic, should always make one doubt meningitis.

A diagnosis between the different varieties of ileocolitis is not always possible. Followlar alceration is distinguished by its lower temperature, rather enhanced course, infrequency of blood in the stools, and by the fact that it is usually preceded by discribed attacks which are often prolonged.

In the enterchal form, the symptoms of an neute inflammation of the colon are usually smallest from the outset—bloody stools, pain, tenderness, tensorms, and fever. In the membranous variety such symptoms are sometimes seen; but, as a rele, the local symptoms are less pronounced, while the constitutional symptoms, especially those relating to the nervous system, are usually marked. The course is usually shorter and more intense than in the other forms.

An agglutination reaction of the B. dycexterior with the serum of affected children is usually present. But for general use in diagnosis this is not of great assistance. It is subject to considerable variation. Moreover, it is soldon present until the end of the first week of the discuss, by which time the nature of the attack is evident by clinical symptoms. Agglutination in the higher dilutions is seen only with the particular type of organism with which the infant is infected.

Programs.—The promper the parient the worse the outlook. The programs is rendered unfavorable by extreme summer heat and by prolonged previous attacks of intestinal disturbance. The outlook is some in secondary than in primary cases. In a given case bad prognostic symptoms are: continuous high temperature, the persistence of much blood in the stools, and severe nervous symptoms. The prognosis is always worse in institutions than in private practice.

Prophylaxis — What has been said in a previous chapter regarding the general prophylaxis of diarrheal disease, applies equally well to cases of eleccritis.

Special emphasis should be placed upon the necessity of energetic early treatment of all the milder forms of diarries, and particularly the cases of mute intestinal indigestion, in order that the process may be arrested before serious anatomical changes have taken place. Equal stress should be faild upon the importance of prempt and intelligent treatment at the very beginning of the cases with a sudden caset.

Hygienic Treatment.—The general plan recommended in the previews chapter should be followed here. A chappe of air is desirable for most cases as soon as the scale inflammatory symptoms have subsided. In the protracted cases which drag on a subscute course, this change will often do more than anything else. Plenty of fresh air is necessary in all cases. The indications for bathing are the same as in other cases of acuts diarrhea. It is undesirable to crosed these patients in institutions, as they always do better when separated.

The diet during the acute stage should be the same as in other forms of acute diarrhes. In the protected cases the diet presents great difficulties; as the children have little or no appetite, and soon come to refuse everything in the shape of food that is offered. In infancy, for the first day or two only, burley or rice water or weak by should be given. As soon as the vormiting ceases protein milk may be given in the manner described in the previous chapter. Buttermilk may be used as a substitute if protein milk cannot be obtained, but is not so efficacious. Especially to be avoided, not only in the acute stage but during convalencence, are cream, all top-neith mixtures, and also the malted foods. Infants, when view ill, are much more likely to take too little than too much food. A careful record should be kept of the amount actually taken in each twenty-four hours. In no case should food be given oftener than every four hours, water and stimulants being allowed between the feedings. In older children the diet during the acute stage should be much the same as in infants, but to them junket from which the whey has been carefully strained may also be given with a speen. At a later period, rare scraped beef, kunerss, buttermilk, skimmed milk, and noslak will be found useful, and during convalescence, eggs, bailed milk, or milk grael made with rice or barley. Special care should be given to the diet for a long time. For months after an acute attack the intestimes are very easily demaged. Belames are excited by changes in the temperature, by great fatigue or exhaustion, but most of all by improper feeding. Especially in older children should such articles as cream, corn, tomatoes, green vegetables, and all fruits be withheld for a long time.

Medicinal and Mechanical Treatment.—Cases, the early stage of which is marked by veniting and thin diarrheal stocks, are to be managed at the outset according to the plan outlined in the previous chapter, vin, purgation, irrigation of the colon, and stopping all food. Caster oil should be administered at the outset—one from at air mouths, two drams at one year, and half an ounce at four years. The salines may be used as described in the previous chapter. If the stomach is at all irritable, caloned, one-fourth grain every half-bour for four doors, may be substituted. Opium is notally required on account of the pain, tensomes, and great frequency of stocks. The slote should be regulated by the severity of these symptoms. The decelorized tincture and paregoric are, we think, preferable to other preparations. Repeated small doses are better than a single large dose. It is very important that opinm should be withheld for at least twelve hours after the initial pargative.

As the pathological process is principally in the colon, and most severe in the lower half of the colon, it can often be much more effectively treated by injections than by drugs given by the month. Irregation of the colon is one of our most valuable means of treatment in these cases. For general purposes a saline solution at 100° to 104° F, should be employed. One or two quarts should be used for each irrigation. The solution should be injected high into the colon through a rectal tube, and early in the disease repeated at least twice a day. When the tenesmus is very great and blood abundant, small injections of either hot water (196° to 110° F.) or ice scaler may be used, and later astringent injections.

The most useful astringent is tannic acid of which one dram may be added to a pint of hot water. Whether unjections are to be used regularly or not will depend much upon the patient. If they are wellborne, they may be given once or twice a day during the attack; but if at every attempt to give them the child struggles, screams, and resists, they may do more harm then good. Complete rest is a very important part of the treatment.

For cases not influenced by the measures mentioned, or those not seen at the cutset, bismuth should be tried, but it is of no use whatever unless large doses are administered. From two to four drams of the subcarbonate should be given in twenty-four hours to a child two years old, and proportionate doses to other children. This may be suspended in maxilage. Tenesures and pain are conclines relieved by the injection of three or four concess of a starch solution to which from five to ten drops of landamum are added. Severe tensories, when not controlled thus, and when associated with prolapses and, is sometimes inneediately relieved by a suppository containing secais. Not more than one-fourth grain should be used for a child of three years.

Although a serum has been produced which protects unimals against inoculation with the B, dyscelerize its use in the treatment of the varicus forms of ileocelitis in children has not been followed by any very striking benefit.

Alcoholic stimulants are needed in many cases. They are indicated by a weak pulse, cold extremities, and great general prostration, no matter at what stage in the disease these approximates are seen. Brandy is usually to be preferred. Generally not more than fifteen or twenty drops every three hours should be given to an infant of one year. Brandy should always be well diluted.

In cases where symptoms have lasted two or three weeks, and the

active once have subsided, when the temperature is scarcely above 100° F., and the stools reduced to four or five a day, it is wise to stop all medication and attend only to the feeding, with irrigation of the colon every two or three days. One is often surprised at this stage to find that patients do better without drugs than with them. The prevailing tendency is to overslose cases of this type. No greater mistake is made than to give these children week after week the various diarrhea mixtures, with the expectation that altimately the formula will be found which exactly needs the requirements of the particular case. The energy tial and important part of the treatment consists in injections, careful feeding and change of air. Astringent enomata, however, are of some value; they should not be given continuously but from time to time should be omitted for several days. Cases are not infrequently seen where the constant use of such injections is an important factor in looping up the production of renews. The colon should first be washed with a large amount of a teptd salt solution and then four or free omess of the astringent solution injected and held in place by compressing the buttoons for half an hour. The patient should be placed in the best possible surroundings; in no disease is a charge of air race to be desired than in this. They should be in the open air as much as possible but should be kept warm for their temperatures quickly fall to subnormal. The dangers of relapses and acute exacerbations continue long after the primary attack has subsided.

AMERIC COLUTIS

Amelia colitis is rare in shibliren in this country; it is particularly so in infants, probably owing to the fact that nearly all the water taken at this age is boiled. Most of the cases in children thus far reported have been observed in warm climates, although Amberg has recorded five which occurred in Baltimore, the youngest child being two years and eight muchts old.

The symptoms in the few cases that have been reported in children have differed in no important particular from the disease as seen in adults. In exceptional cases the onset may be abrupt and the attack may run an acute course, terminating fatally in two to three weeks. Such cases are characterized by much abdominal pain and tenderness, frequent mucous and bloody stools containing amelias, and some fever, which, however, soldom reaches 102° F.

More frequently this scute enset is followed by a subscute or chronic form of the disease, or the disease may be subscute from the beginning. The protracted cases are those most frequently seen. They are very obstinate to treatment. Periods of constipation and apparent recovery often alternate with encertainous in which the bloody and murous stools recorn, with pain, tenesims, and slight fever. The duration may be from a few months to one or two years. Death may finally occur from exhaustion with entreme wasting, or from some complication, such as hemorrhage, absences of the liver being very rare in children. The diagnosis from other forms of colitis is made only by the discovery of pathogenic annelse in a freshly voided shot.

The general treatment is the same as for other forms of acute or subscate coletis. The special treatment for the purpose of destroying the another locally is the use of injections of quasin which may be employed in solutions varying in strength from 1 to 5,000 to 1 to 250. Recently subcutaneous injections of emetin hydrochlorid have been used for amotic colitis with very favorable results. Emetin should be given in doors of gr. 1/12 to gr. 1/4 depending upon the age of the child. The dose should be repeated two or three times at intervals of a day or more. The drug is a very powerful one and is to be used with caution.

AMYLOID DEGENERATION OF THE INTESTINES

This is rarely rect with in infants. It is not so infrequent in older rhildren, where it is associated with amyloid changes in the liver, spleen, and kidneys, usually as a result of prolonged supportation in connection with bone tuberculosis. It is sometimes met with in syphilis. The ileum is the part of the intestine most affected. The process begins in the walls of the arterioles and capillaries, particularly of the villi, and later involves the vessels of the submicrosa; subsequently the epithelium may be affected. The macous membrane in those cases is pule, somewhat translucent. The condition is recognized by the application of the isdin test; the affected villi become of a brownish-red or malagany color.

Amyloid degeneration produces no definite symptoms. Diarrhea is frequent but by no means constant. The anemia and waxy cachexia which are present are probably dependent much more upon the associated lesions of the liver and kidneys than upon the changes in the intestines.

TUBERCULOSIS OF THE INTESTINES AND MUSENTERIC LYMPH NODES (MESENTERIC GLANDS)

These two conditions are usually, but not invariably, associated, and may be conveniently considered together.

Prequency. In a series of 386 autopairs upon tuberculous cases from

our hospital records, the intestines were involved in 40 per cent. The great majority of the patients were under three years of age. In 131 autopess upon tuberculous cases published in the Pendlebury Hospital Reports, the intestines were involved in 50 per cent. These patients were mainly between four and fourteen years old. In 209 autopass upon tuberculous children, chiefly infants, reported by Müller, the intestines were involved in 28 per cent. In L316 autopass collected by Bostert there were intestinal bosons in 31.6 per cent. Intestinal tuberculous is most common from the third to the eighth year. The mesenteric lymph nodes are more frequently involved than are the intestines, though the two are usually associated. They were tuberculous in 52 per cent of the Pendlebury cases; and in 178 recent autopases at the Rabies' Hospital upon tuberculous patients, published by Bartlett and Wellstein, these nodes were involved in 63 per cent; in 10 per cent they were apparently the oldest tuberculous lesions.

Etiology.-While it is no doubt possible for infection of the mesenteris nodes to occur through the general circulation, this is exceptional. In the great impority of cases infection takes place from the intestines; i.e., then are examples of interculous by impostion rather than by inhalation. The buelli in the intestinal tract may be derived from food or from spatime which has been coughed up and swallowed. Of 96 cases of abdomical tuberculosis of all varieties in children under sixteen years, studied by Park and Kramwarde, the infection was of the borine type in 53, and the human type in 44 cases. Of these children, VI were under five years and 35 between five and sixteen years. The proportion of basine infectious was alightly larger in the younger group. Primary intestinal telesculosis in this country is relatively infrequent. When it dice occur, however, it is more often due to a bacillus of the bovine than of the human type. The inference is probably justified that in cases of lovine infection, interculous milk was the source of the infection. The intestinal lesions most often found in infants and roung children are mild in character and are usually associated with and secondary to an advanced pulmonary lesion. They are doubtless due to swallowing tuberculous syntum. In such cases the human type of bacillus is found.

Lesiens—Intertions.—The usual sent is the small intestine, chiefly the jejumen and lower ileum. With extensive disease the large intestine may also be involved, most frequently the occurs, and exceptionally it alone may be affected. Tuberculous afters may be found in the appendix.

The early deposits appear as tiny yellow nodules, not numerous but widely emittered and generally affecting Peyer's patches. Usually, however, along are present, and often only along are seen. Their size and number vary greatly, there may be only five or six tiny ulors, or there may be forty or fifty, the largest being two or three inches in diameter. They very frequently involve Peyer's patches. The typical tuberculous ulcer is of irregular shape, with rounded borders and with its longest diameter at right angles to the intestinal axis. When large, it may nearly encircle the gut. The ulcers are encayated; they have overlanging, infiltrated edges of a deep-red color. The surface is covered with granulations. In those which have partially healed a distinct perforing of the intestine occurs, which is repecially neticeable upon the peritoneal surface. The small nlows involve the mucesa only; the larger and older ones the submucosa and the muscular routs, and not infrequently also the serous cont. Perforation may occur, but rarely into the general peritoneal cavity, as a localized plastic inflammation precedes it. There may be adhesions of adjacent intestinal rolls, and listaine may form, owing to niceration at the point of contact. With these severe cases there is always associated more or less extensive tuberculous peritonitis, frequently of the ulcerative variety. Like other tuberculous processes, the infiltration. and ulceration may cease at any stage, and ricatrization follow. If the nicers have been large ones, there is always some narrowing of the lumen of the intestine. Stricture is rarely seen because most of the children die from the general discoon before it has had time to occur. Monti has reported a case of obstruction at the ileaceral valve, due to an old interculoss cicatrix, in an infant of twenty-one months. One has come under our observation in a child of nine years, in which the obstruction was in the colon, just beyond the ilcocycal value.

Mesesteric Lymph Nodes.—Usually these tuberculous lymph nodes are from half an inch to an inch in diameter; occasionally they may reach the size of a ben's egg. From a fusion of several of them, tumers of considerable size may be formed. We have seen one such mass as large as the head of a child at birth.

The process is the same as that which occurs in other lymph nodes of the body. There is a toberculous inflammation, followed by cascation, softening and abscess, or by calcification. Localized peritonitis is found in all the marked cases; this is usually plastic, but may be suppurative when due to the rupture of an abscess. Pressure upon the term cave may lead to dropsy in the lower extremities. Offlicier has reported a case in which thrombons of the vena cave occurred. Pressure upon the perial term may lead to ascites and deflatation of the superficial abdominal veins. There may be pressure upon the thoraxic duet.

Symptoms.—The symptoms of intestinal tuberculosis are exceedingly irregular. Ulters are very frequently found at autopsy when there have been no marked intestinal symptoms; thus is especially true of the small ulters usually seen in infants. On the other hand, diarrhen is not uncommon in cases of advanced general tuberculosis where no ulters are

present. It is the most frequent symptom of ulteration, and may be exceedingly obstinate. The stocks do not differ essentially from those in protracted cases of descolits except in the occurrence of hemorrhapse and in the presence of talercle tarilli. Henorrhages are not very frequent, but they may be so large as to be the cause of death. This occurred in one of our cases, an infant nine months old, the blood coming from a single alter in the sloam. Hemorrhage is more common in older children. In some cases localized abdominal pain or tenderness is perscut. In advanced cases the symptoms of intestinal alteration are nearly mingfed with those of peritoritis, and there are also present the enlarged mesenteric length nodes, which may aid in the diagnosis. In the majority of cases, these nodes are recognized only by deep palpation. A rectal examination may give additional information. The turners are generally felt as irregular nodular masses, lying close against the spine, not movable, and sometimes tender on pressure. Other tamore from deposits in the perituroum may be present anywhere in the abdomen; they may be superficial or deep. The other symptoms are due to the complications already mentioned and to inherculasis elsewhere.

Diagnosis.—The only positive evidence of intestinal tuberculosis is the discovery of the bucilli in the stools. They are here to be carefully differentiated from smegma and other forms of acid-fast bacilli. In the absence of such evidence, the discuse is differentiated from simple fleocolitis, first, by the signs of tuberculosis elsewhere in the body, aspecially in the lungs, these being almost invariably involved; secondly, by the slow onset and gradual development of the symptoms, while in ileocolitis an acute attack has almost invariably preceded. Large hemorhages should suggest tuberculous. A positive reaction to the tuberculin skin test is of much assistance in diagnosis, as is also the presence of pulpable measureric glands.

Prognosis.—This depends altogether upon the extent of the tuberculous disease elsewhere, as it is extremely rare for the intestinal lesion to be the cause of death. Once formed, the olders probably remain, ciratrization being very rare, and then only partial.

Treatment.—The only symptom which ordinarily demands treatment is the diarrhea. When severe, this is to be managed much as in cases of sleocolitis, except that irrigation of the colon is, of course, not called for. The chief reliance must be upon diet. Bismuth and opium may diminish the peristaltic somewhat. No drugs can affect the process.

CHAPTER VIII

DISBASES OF THE INTESTINES-(Continued)

CHRONIC INTESTINAL INDIGESTION

This diagnosis of chronic intestinal indigestion is frequently made when it is not the digestion of the child but the character of the food which is at fault. The term should be reserved for those cases in which, with proper feeding, there are marked and persistent evidences of disturbance in intestinal digestion, usually with great retardation in physical development.

Chronic intestinal indigestion is especially common in children from the first to the fifth year.\(^1\) It is soldon seen after that time. In a small proportion of cases it is apparently the result of a constitutional weakness. Nursing infants or infants who have been artificially fed during the first few months in a manner that cannot be entitized and who have thrived fairly well may, when the change to solid food is mode, be quite unable to digest this or may even gradually manifest an inability to

digest and thrive upon cov's milk however modified.

Some cases are clearly the result of improper feeding. With lottlefed infants this is usually the giving of too great proportions of fat.
With children taking solid food the trouble usually arises from giving
this too early or in too large quantities, especially when the food has been
improperly cooked, such as cereals, regetables, and especially petato. But
the most frequent cause of the condition is a previous severe or prolonged attack of diarrhea or dysentery from which the child seems never
to have entirely recovered. Those who have previously been delicate or
who have had prolonged digestive disturbance before the zente attack are
particularly liable to be affected. The condition is seen in all grades of
secrety but more commonly in the middle or upper classes, for among
the very poor indiscretions in diet are likely to precipitate attacks of
arute indigestion which may be fatal.

There are no characteristic pathological changes other than a dilatation of the small and large intestine, shorfly the latter. In some cases this may be extreme. Children who are the subjects of chronic intestinal indigestion seldom do from the condition itself, but usually from some acute process engrafted upon it, chiefly of the lungs or gustro-intestinal tract. There are then found only the besiens of the terminal infection

or condition

^{*}Prolonged disturbances in interioral digestion during the first year bave been considered under Deficult Feeding Come.

Symptoms.—The clinical picture which these cases present is a very common one, and the symptoms are quite uniform. The patients are generally very thin, with small extremities, a small amount of subcutaneous fat, and a large providerant abdomen (Fig. 43). The size of the abdomen is perhaps the most striking feature of the condition. This is partly due to dilatation of the small intestine, but chiefly to dilatation of the colon which is regularly present in this condition. It



Pro 43 — Convert Isramina, Demonstrate — Patient Time sents old: symptoms of three years' duration, following about of sents fiscontine, Bright, 24 inches; creenshers care of abdomen, 222 inches, weight, 24 pounds.

occurs partly as the result of an excessive fermentation of food and partly from the relaced condition of the muscular coats of the boxel. There is no hypertrophy and no ulceration. Dilatation of the intestine is further favored by a similar condition of the muscular walls of the abdomen which in marked cases become extremely attenuated, almost transparent. This relaxation is to be attributed partly to the poor matrition and partly to the constant pressure from within.

The colon is often dilated to a diameter of three or loar inches, as shown by X-ray examination, and sometimes even more than this. An erroneous diagnosis of Hirschsprung's disease is often made in such cases. The circumference of the abdomen may be several inches greater than that of the chest. Tymponites is constantly present although much gas may be possed per rectum. There is a marked tendency for the tympanites to increase during the day time and to diminish at night so that the variation in the circumference of the abdomen is usually two or three inches and sometimes as much as four or five inches in twenty-four hours. This

variation is of assistance in differentiating the condition from tuberrulous peritoritis with which it is frequently confounded. Such children are pale, anemoe, sullow in complexion and haggard looking; they have dark rings under the eyes; they are fatigued on slight exertion; they are very cross, irritable, and emotional to an unnatural degree. They are hard to annue, hard to control, and altogether exceedingly difficult patients to deal with. Their growth is returded if the symptems have hard long. They are much below the average in height and weight, but mentally often quite precedious. One of our patients at three years weighed twelve and a half pounds and was twenty-nine inches tall and another patient at five years weighed twenty-two pounds and was thirty-three inches tall. The sleep is always unnatural and insturbed; and at night the children toss about their crits, waking frequently, crying out and often grinding their teeth. They perspire very readily, and suffer from cold extremities.

The bowels alternate between constipation and diarrhea, the former being more frequently present. At such times the stools are generally of a light gray color or nearly white. The odor of the stools is usually extremely foul. With diarries the stools are often not very frequent, not exceeding four or five a day, but they are large, gray, green, or brown in color, acid in reaction, aften frothy, offensive, and always contain undigested food. A stool in many cases is immediately excited by the taking of food. From time to time, in many patients, large quantities of rescus are passed; in some cases this comes to be a constant feature of the disease. A striking feature is the large size of the stock in proportion to the amount of food taken. The obstracal examination of these stook when cow's milk is taken, shows that the chief solid constituent is fat which frequently forms as much as 60 to 70 per cent of the dried matter of the stool, as compared with the normal of 20 to 40 per cent. The earlichedrates which are taken are largely broken down by the excessive fermentation which takes place in the intestinal tract. Large quantities of gas are expelled. Pain is not a very common symptom, but discomfort from the great tympanites is frequent. The appetite is capricious and usually poor, though some patients have a verselous appetite and will out everything offered. The tangue is usually clean and the breath is not offensive unless the stomach is also affected, when the tongue may be coated.

The pervous symptoms which these patients present are exceedingly varied, and often of the most pumling character. In some cases there are from time to time attacks in which they are so severe and so persistent as to lead to the diagnosis of organic disease of the brain. In addition to the condition of general nervous irritability, there may be tetany, fainting attacks resembling somewhat the secures of petit soil, exaggerated reflexes, attacks of duliness or sometimes stopor, with irregular pulse and respiration and other symptoms strongly suggestive of tuberculous mensingitis. Consulsions are not uncommon. They are notally accompanied by fever, and may be repeated at intervals of a few minutes. There is almost no end to the combinations of nervous symptoms which these patients may present. The skin shows frequently eruptions of crythems or of articaria.

Most of these cases are without fever; but in some a slight fever is present for weeks at a time, the temperature usually varying between 99° and 101.5° F. Occasionally it may rise to 102° or 103° F. during an artite statement in the symptoms. The urine of most of these patients contains a great excess of indican and the amount present often fluctuates regularly with the across symptoms. The weight may remain stationary or there may be a gradual loss for some time. When improvement takes place the gain is apt to be rapid but very irregular. Great fluctuations in weight are characteristic of this condition and are to be explained by retention and loss of water. Attacks of general ederm with rapid gain in weight are occasionally seen. Intercurrent attacks of neute indigestion, with diarrhen and constimes also comiting, are frequent and easily excited. Occasionally there are seen attacks of intercurrent intestinal infection with the dysentery hacillus, or other organisms.

The course and duration of these symptoms are indefinite. The milder cases if recognized early and promptly treated often recover in a few menths, though careful feeding must be continued for a long time to prevent relapses. The severe cases under the most favorable excomstances last many menths and usually several years. In those which progress favorably, improvement is usually first seen in the digestive symptoms, next in the nervous symptoms and last of all in the weight. In the most severe forms, if untreated, the patients gradually waste until they die from exhaustion, or fall easy victims to any acute ducase which they may happen to contract. There is but little tendency to spontaneous recovery.

Herter has called attention to a type of this disease associated with marked arrest in growth to which he gave the name Intestinal Infantiltom. In several such cases studied he found a failure of retention of calcium and magnesium salts over a prolonged period of time. To this he acceled the arcested development of the skeleton. Associated with this, there were present evidences of excessive intestinal putrefaction. The harterislogy of the condition he believed to be characteristic, via, a propositerance of the B. believe, with great diminution or entire absence of the B. coli

Pregnesis.—This depends upon the duration of the symptoms, the general condition of the patient at the time treatment is begun, and upon how thoroughly it can be carried out. The symptoms, in the great majority of cases, have existed for several months at the time the case comes under observation. Generally, the greater the mistakes in feeding have teen, and the greater the violation of brguenic and district rules, the better the progresses. A child who has developed abronic intestinal indigestion of a severe type, in spite of the fact that the hygicals surroundings were good, and when the district errors were not flagrant, a not nearly so hopeful a subject for treatment as one whose hygicals surroundings have been poor and whose diet has been especially but.

In cases like the latter, a removal of the causes and the institution of proper methods of treatment almost invariably result in immediate and striking improvement, unless the general vitality of the patient has been reduced to a very low point. In the other cases where the mistakes have been less marked and the condition is due more to constitutional than to local causes, the improvement is slower and loss striking. Thus, as a rule, hospital patients improve more rapidly than those seen in private practice.

Treatment.—In no class of cases that the physician is called upon to treat are results more satisfactory than in many of those of chronic intestinal indigestion, when intelligent cooperation can be secured. But the reverse is also true and no cases are more upsatisfactory than those when intelligent cooperation cannot be accured. Treatment is very difficult at best; recovery is a very slow process and the periods of examerbation of symptoms that occur with almost every case are exceedingly trying to anxious purents and relatives. If the purents themselves are lax in discipline, and are smalle to control the child, an efficient trained nurse should be secured, into whose hands the exclusive management of the child should be placed. In any case it should be understood that the duration of the symptoms is likely to be from one to two years and may be much longer. The adoption of a consistent plan of treatment continuously carried out for a long period is indispensable to success.

The essential part of the treatment is diet and general management. It should be remembered that the condition is in most cases primarily one of fat indigestion and intelerance. To this there is soon added intelerance of carbohydrates and often the latter becomes the prominent feature. When there is intelerance of both carishydrates and fats, it is apparent that there can be no gain in weight. The best that can be done with these patients is to keep them for a long time upon a diet made up almost entirely of protein food. On this one should be content if the weight remains stationary or if there is but a slight loss. As the digestive condition improves, fats or carbohydrates, according to the talerance, can gradually be added to the diet—at first only in very small amounts. In most cases the conditions must be not empirically and many mistakes and consequent relapses are likely to occur.

At the outset the most important thing is to stop all starchy food for a considerable time, and put the patient upon a diet consisting only of rare beef, beef juice, junket without whey, buttermilk or protein milk. Skimmed milk is well horse by only a limited number. After some improvement has occurred carbohydrates may be added, but very gradually beginning with small quantities (not more than one tablespoonful a day) of well-useled cereal. The number of feedings should not be more than four a day during the second year, and three or four a day for children during the third and fourth years. These should always be at regular intervals, and nothing whatever given between meals. The meat should be rare scraped beefsteak or lamb chop; from one to three tublespoonfuls may be allowed once a day. The white of egg may be given early, and after a time, the whole of a hard-boiled egg very finely grated.

After improvement has been going on for two or three months, bread may be added, at first in small quantities and once a day. This should preferably be stale, out thin and dried in the oven until it is erisp, and given without butter. Mutton, chicken, or beef broth, without vegetables, may be given recessionally in the place of one of the milk feedings. After this diet has been kept up for three or four months, if improvement continues, one of the green vegetables thoroughly cooked and strained may be added once a day. A striking feature of these cases is their marked intolerance for sweet cow's milk. This must be withheld for a long period. This restricted diet should be continued for at least a year or until all the symptoms have disappeared. Potato should be forbidden for a long time. A few of the patients can take olive oil when they contout telerate any other form of fat. This may be tried very carefully, beginning with one tempercular a day.

Intestinal irrigation is occasionally useful for brief periods in some cases in which there is much mucus passed; no astringents, but only a warm soline solution should be used. But it should not be forgotten that continued irrigation often been up the production of mucus, and also that the introduction of large amounts of water may increase the intestinal distantion.

The constitution can sometimes be controlled by the diet alone; but in most cases drugs are needed also. As laxatives in this condition preparations of rhubarh, or cascara and the compound licorice powder are serviceable. On account of the great tendency to abdominal distantion due to excessive fermentation and atomy of the intestinal walls the bewels must be kept well emptied. Most patients do better when two stools a day are secured, the second if necessary by an enema, but the frequent use of large intestinal injections is to be avoided. Abdominal massage as af much benefit in most cases.

Drogs directed against the process of putrefaction are extremely unsatisfactory even in older children and are not to be recommended. Of little value also is the administration of the various digestive ferments. General tonics are semetimes useful during convalescence and apparently assist in the improvement of the general condition, but during acute exacerbations their use should be interdicted. Nux vonice is the best combined with some mild preparation of iron. Cod-liver oil, particularly in the early stage, is builty borne.

Relapses are easily excited by indiscretions in diet, and parents should be impressed at the very beginning with the necessity of softering rigidly to the diet prescribed for a long period. It very often happens that the improvement which is seen after one or two months of careful treatment is so marked as to lead the parents to the belief that a cure has been accomplished, so that they relax their vigilance and allow improper articles of food which are almost certain to induce a relapse. If the case is an aggravated one, and the symptoms of long standing, it is wise to tell parents at the outset that a year's treatment is the minimum in which anything permanent can be accomplished.

The general treatment of the patient must not be overlooked. Proper clothing, regular exercise in the open air, coel sleeping rooms, massage and, when the condition is such as to permit it, sponging every morning with cool water are all of very great importance. An elastic abdominal handage giving moderate support not only adds to the comfort of these patients but to some degree prevents the excessive distention likely to occur on account of the loss of non-miar tone in the abdominal walls. The improvement in the nervous symptoms of the patient is often one of the first things noticed. From an irritable, fretful, prevish child the patient is sometimes totally changed in disposition in a few weeks, so as to become quiet, affectionate, docile, and playful.

INTESTINAL COLIC

The term color is applied to any severe paroxysmal pain occurring in the intestines. It may be due to many causes. The color of lead and arsenic poisoning are both very rare in children; but colocky pains are present in appendicitis, introsusception, theoretis, and, in fact, in all the severe forms of intestinal inflammation. Color may be due to swallowing certain substances, especially foreign bodies and the seeds of fruits; and in rare cases it may be exceed by the presence of reconworms when they are numerous. In all the conditions mentioned, colois only one of the symptoms, although it may be a very prominent one.

The peculiar colic of infancy is clearly caused by spasm of the musrular wall of the intestine. It is a heighbored reflex from irritation of which we have many other illustrations at this period of life. The cause of the irritation is usually the presence of some undigested food in the intestine. Colic is therefore assentially a symptom of indigestion. Flatulence and colic are very often, but not always, associated. Colic is always increased by the coexistence of constipation, which in many coses is its selectause. Almost any of the elements of the food may give rise to rolic.

Sugars and starches produce it by causing excessive fermentation and flatulence. Fats are less frequently at fault; but the presence of large unabsorbed masses in the intestine may be a sufficient excess of irritation. The actual pain in colic is purely from distinction, but chiefly from noncolor spasm. In some of the most severe cases of colic it is possible that the spasm may be accompanied by a slight transcent introduception. Colic may follow chilling the surface of the body. In these cases, also, muncular spasm appears to be the principal factor in causing the pain. The colicky period of infancy is chiefly the first three months; after this time the peculiar susceptibility gradually passes off.

Symptoms.—These are in most cases so typical as to be easily recognized. They are always more severe in delicate and highly nervous children. In the severe attacks there is contraction of the features, a load particesmal ery, subsoling for a few moments and then beginning with renewed intensity, drawing up the lower extremities, and in male infants contraction of the scrotum. With these symptoms the abdomen is usually found tense and hard. With the expulsion of gas, the symptoms usually subside at once, and the child falls askep. In the most severe attacks there may be considerable prostration, cold extremities. and perspiration. When the symptoms are less severe there is only continual fretfulness, and the child can not sleep. When colio is habitual there are very few hours in the twenty-four when the child seems to be cutively combetable. In nursing infacts there may at times be difficulty. in distinguishing the cry of colo from that of langer, as infants onfering from cohe will usually take food eagerly, and this is often followed by temporary relief. In colic, however, the pain soon returns, and often is more severe than before. The cry of colic is usually violent and personsul; that of hunger is apt to be prolonged and continuous, and is not accompanied by the other symptoms mentioned as indicating abdominal pain. In older shilling the less frequent suuses of colle montioned at the segmning of this article, especially appendicitis, should be home in mind.

Treatment.—When solis is due to flatulence of the intestine, nothing given by the mouth has much effect in relieving the symptoms. Certainly food should not be given. The purpose of treatment during the attack is to assist the child to get rid of the gas; as this is usually in the colon, the most efficient means is by massage or enemata. At first an injection of four or five ourses of lukewarm water should be used. If this is not ourcessful, two oursess of colder water with half a temporaful of glycerin may be tried. This rarely fails to start peristals and

expet the gas. In conjunction with these measures, flry heat should be applied to the abdomen by means of his flannels or a hist-water bug, and the feet should be well warmed. The treatment between the attacks and this treatment of injectual colle should be directed toward the constipution and the injegestion, upon which they depend.

CHRONIC CONSTIPATION

Constipation may be said to exist whenever the stools are been frequent and firmer than normal. During the early months infants usually have two movements a day. Many, however, have only one; but if this is normal in character the child is not constipated. In other cases, although there are two and even three stools a day, they may all be small, day, and hard, having all the characters of constipated stools, and the case should be treated accordingly.

Etiology.-The causes of chronic constitution are many and farreaching. It may be due to a diminution in the secretion of the intestinal glands or of the laser. The movements are then hard, dry, very light-colored, and are associated with much flatulence and other signs of intestinal indigestion. Very often the principal factor in constitution is insufficient muscular contraction in the intestine. The feed muses are then propelled so slowly and remain so long in the intestine that the fluid portion is absorbed, the residue becoming, in consequence, so dry and hard that it is difficult to expel. In other cases constigution is due to the fact that there is insufficient volume to the stools, as may he the case when the food leaves very little resulus. Constipution may depend also upon local ranges, as, for example, where an execution of the bowds is resisted on account of pain from Saure of the area or from honorrhoids. Although not the primary cause, this condition may be sufficient to keep up the constipution indefinitely. It may in rare cases he due to a congenital condition, such as narrowing or twisting of the large intestine at some point. Another rare cause seen especially in infancy is tonic spasm of the anal sphinoter. The most important causes of constipation may be grouped under two heads; diet; and conditiongiving rise to muscular atouy.

Diet.—In breast-fed infants the trouble is usually low total solids in the milk. In those who are artificially fed at is most offen because the sugar is too low, and sometimes because all the solids are too low, the steel lacking volume. In other cases the cause of constitution is indigestion, especially of fats, in still others the use of sterilized milk. During the second and third years the cause may be too much our's milk, particularly that which has been boiled, or the use of an excessive amount of starchy food. In older children, he cause may be an excess of milk and starchy food and a lack of green vegetables, coarse cereals, meat, fruit, and water.

Muscales Atony.-The most common cause of muscular atony is liabit; in a large number of cases lack of proper training is the principal etiological factor. If the inclination to have a stool is regularly disregarded it soon ceases to be felt. The ordinary irritation from foral masses produces no response whatever. The longer such a condition continues the more obstimate does it become. This is an important factor in all cases. Another cause of muscular atony is rickets. In this disease the musesiar walls of the intestine suffer like the muscles of the extremities, and become incapable of doing their work. Again, are form of realisatration in which there is feeble muscular tone may cause or aggravate constipution. It is often seen as a sequel to acute attacks of diarrheal diseases, particularly when these have been prolouged. Want of sufficient muscular exercise is a frequent cause. There are many children who rarely suffer from constitution in summer when they have plenty of autilious exercise, who very often do so in winter when such exercise is wanting. A loss of numeralar tone is not an infrequent result of the prolonged and indiscriminate use of purgative drugs or enemala.

Symptoms.—In most children no symptoms are present except the boral ones, the general health being excellent and the nutrition in no way disturbed. In some, however, there are symptoms of greater or less severity, depending somewhat upon the cause of the constipation. There may be simply flatulence and colleky prins, or the irritation of the bardened feeal masses may produce a slight enterthal inflammation of the sigmoid flexure and the rectum, so that mucus and sometimes traces of blood may be passed with the stool. Hemorrhoids may develop even in inflancy, and frequently the sensiant straining leads to the production of hermia. In many cases there are from time to time nervous symptoms resulting apparently from the absorption of various toxic materials from the intestine. There may be heafache, dulness, fretfulness, disturbed alcop, and associated signs of intestinal indigestion. The prine often contains indican in excess, and there may be slight fever.

Diagnosis.—This includes the discovery of the cause and the principal scat of the constipation. To arrive at the former the most careful and thorough investigation should be made of the child's diet and habits. It is desirable to determine whether the sent of trouble is the rectum, the colon, or the small intestine. If a suppository is almost immediately followed by a normal stool, one may be sure that the rectum only is at fault, and that it needs but a little extra stimulus to make it do its work. This is common in infants who are too young to make any voluntary efforts. In such cases there are no other symptoms present. In others, the white or gray shools, marked flatulence, offensive breath, and general irritability, leave no doubt of the fact that the trouble is due to indigestion.

Treatment.—The successful treatment of checoic constipution in children is accomplished only by a careful study and regulation of the child's routine. In treatment, training, habits, diet and exercise play the most important, and specific remedies the least important part. Cure of the constiputed habit is always difficult, and in most cases treatment must be continued for a long time. The cooperation of an intelligent mother or murse is absolutely indepensable. To establish the habit of regular stools should be the first step, for without it nothing can be done. This training should be begun in intancy. Even in young infants regular babits are formed without difficulty if the child is put apon the chamber or chair invariably at the same hour. When a local stimulus is required in addition, an siled glass rod or a gluten suppository may for a time be inserted. An older child must be taught to heed the first impulse to evacuate the bowel. Regular habits can hardly be formed unless the same time each day is chosen for the movement, That to be preferred is soon after the morning meal, as taking food into the storach starts a peristaltic wave which is continued throughout the intestine. This has been demonstrated by the X-ray to occur even in the colon. With older children breakfast should be early enough to allow ample time for this duty before the other engagements of the day; and nurses should be impressed with the importance of the early formation of proper labets on the part of their charges. It is a part of nursery discipling which should invariably be insisted upon. Stretching the subineter under an anesthetic is sometimes of great benefit in infants, especially when tonic spasm is present.

Facil.—With nursing infants who get good breast-milk constipation is not common. When the milk is low in solids, constipation is frequent. In feeding cow's milk, constipation is overcome by giving the proportions of sugar, protein and fat which are best suited to the infant. It is rather more upt to occur with infants when, on account of digestive symptoms, modifications of whole milk or skimmed milk are given instead of those from top-milk. But constipation is also seen at times when the fat is too high. The laxative effects of all sugars, but especially multose, should be remembered (see Infant Feeding). With infants during the first year, chronic constipation may be largely prevented by proper milk molification.

During the second year children who suffer from constipation are usually benefited by reducing the amount of milk and giving more solid food. Especially valuable are the coarses occuse thoroughly cooked and puries of given vegetables,—peas, string beaus, spinisch or asparagua tips. Meat beetle and beef juice are somewhat laxative on account of their extractives and salts. Fruits are valuable in all these rases; but only the juices should be given until a child is about fifteen months old. That of cooked fruit or almost any fresh fruit may be suppleyed. After fifteen to eighteen months pulpy fruits may be given, but only after thorough cooking and straining,—apples, primes, peaches, plums and pears, in moderate quantities; but berries should be avoided. Bay fruits should soldern be given to children under three years old, and after that age in moderate quantities only.

For older children who are on a mixed diet the amount of starchy. food should be moderate. Course servals only should be given. Milk should be given rather sparingly; it is cometimes advisable to stop it altogether. All bread should be made from whole wheat or unbelted flour. Bran bis-mits are also useful. Meat and broth may be allowed freely, also green regetables and vegetable salads. All fraits allowed infants may be used, but in larger quantities, and in addition scraped raw apple. Of the dired fruits, dates, primes and figs are permanole, but only after cooking. Fresh fruit is preferably given in the moming, oranges being especially useful when laken on rising. A contion necessary in the use of fruits and ceause foods for coordinated children. It often happens that constitution is only one of the symptoms of a chronic intestinal indigestion, and such foods as those mentioned, while they may cause the bewels in more, frequently aggravate the primary condition. They provises abdominal pain, flatmener, and the discharge of mucus in the shoots. The administration of some mild lighter over over a considerable period is often much loss objectionable,

The limitive effect of sugars may be utilized with older children, but they must be given with contion not to disturb digestion. Two or three tempercusfuls of honey may be given with the breakfast or supper. Mobasses may be used much breakful or may be added to cooked feeds.

Either has or cold water, when taken an bour before breakfast, may be of remoderable benefit to offer children. The accessity of supplying sufficient fluids as upt to be overlooked, especially when milk is excluded from the dast. While a bilaral amount of water is indispensable, there is no advantage in excessive water drinking. The sparkling waters, like Vichy se Apollinaris, are sensitimen better than plain water.

Massage, when properly employed, is smold in conjunction with other measures, but rarely succeeds alone. It should be given for five or ten manufes after retiring and just before rising. A proper amount of general mountar exercise a necessary and should be made a part of the treatment in every case. Special exercises for the development of the abdominal muscles when faithfully carried out are of particular lensit.

Posture during the stood is of some importance; in certain cases a cure is effected simply by entertiming a law seat on a warsery chair or closel for the high one previously used.

Suppositories.—In many cases, particularly in young infants who are not old enough to instinte the manualar effort, a slight stimulus to the rectum is all that is required. The man of oiled paper has a great reputation in domestic practice and is not objectionable. It may be of assistance in establishing a proper lastit. Soap suppositories produce a more marked irritation; although their immediate effect is quite units factory, they should not be continuously used. Glycerin suppositories are even more objectionable. For occasional use they are convenient, but their frequent use, especially in infants, is likely to cause bee much irritation. Giuten suppositories produce less critation and are consequently aboven in their effect, but they have not the same disadvantages. Suppositories are useful only when the trenths is in the rectum.

Enemate.—Water ensumts should not be used regularly for the relief of chronic constipation. For immediate relief they are aften necessary. The injection of one or two drams of glycerin in a few sumers of water is one of the most efficient means of moving the bowels at our command. Cases of fecal impaction are meels not with in children. They are to be managed as in adults, by repeated injections of soap and warm water or of ox-gall, and sometimes by mechanical removal. An injection of an owner or two of sweet oil may facilitate the pusage of very hard and dry stools, and a regular nightly repetition of this, or a somewhat larger amount, for several weeks will semetimes break up a constipated halor.

Medicinal Tevateseat.-This is the least important part of the management of chronic constitution. The most valuable laxatives are preparations of easeurs, nox ventica, beliadours, hypersumus and phenololithaless. Though in most obstinate cases they are necessary, they should be used as little as possible and the dose gradually dominished. With most drugs the prolonged use of small doses is better than the occasional use of large ones. Caseara may be used either in the form of the elixir (dose from one-half to one dram), or the fluid extract, from one to five drops. Blabarb, either in the form of the syrup or the mixture of thuburh and soda, may be given occasionally, but it is not adapted to continuous use. Of salines, magnesia and phosphate of soda are best for continuous use in infants. All the proparations of malt process slight laxative properties, and are useful in conjunction with dieteric and other medicinal means; any of the extracts of malt may be employed. Olive oil is often of assistance in the treatment of the constipation both of infants and older chaldren. To the former the usual dose is one tenspoonful three times a dart to the latter, two or three times this amount should

be given. Mineral oil (petrolutum liquidum) is a valuable remedy, but is applicable only to older children, to whom from half an ounce to one and a half ounces shally must be given. It should be administered on an empty stomach, or it is likely to disturb digostion. As it is not absorbed, its action is purely local. The latest investigations indicate that the Bussian oil has no advantages over American products, provided the latter have been suitably refined. Agar-agar has a beneficial action by rendering the fecal mass softer and more easily expelled. It should usually to combined with some other laxative such as phenolphthalein, curcum or rhuburb. It decold be broken up into fine fragments and may be mixed with the cereal, with thick soup or simply with water. The dose is two or four tenspoonfuls shally.

HYPERTROPHY AND DILATATION OF THE COLON

(Hirschapung's Discout)

Hirschsprung's disease is characterized by a great increase in the diameter of the colon and in the thickness of its wall. It was originally believed to be an idiomathic condition for which no sufficient anatomical rause could be found. Hence it has been known as congenital ar-"shoputhie" dilatation of the colon. Within recent years, however, it has become increasingly clear that in the majority of cases there is an obstruction to the passage of the intestinal contents through the large intestine, although when the intestines are removed and laid open, no evidence of abstruction can be found. The foliatation and hypertrophy are greatest in the sigmood, and in about one third of the cases, this alone is affected. In the majority of instances, however, all of the colon is involved; very rarely only the colon above the beginning of the sigmoid is affected. The degree which the dilutation and hypertrophy may reach is coormous. The colon may fill the greater part of the much dilated abdominal cavity. There may be pressure upon, with a certain amount of atrophy of, the rest of the abdominal contents and the capacity of the thorax may even be encroached upon, the displiragm being displaced apward to a marked extent. The imposated contents of the colon may be many pounds in weight. The hypertrophy is chiefly, due to an increase in the circular muscular fibers of the affected portion of the large sutestine. The mucous membrane may be normal or there may be large and oftentimes deep ulcers which usually do not extend beyond the necesular coat but may involve this and even lead to performtion of the intestines with the consequent lesions of peritonitis.

At operation and at autopsy, when attention is especially directed

to the obstruction, it is found that this is usually the result of an abnormally long sigmoid and mesosigmoid which allows the lower portion of the sigmoid flexure to fall forward and downward, thus producing an augulation at its junction with the rectum. With the formation of this augle, the tendency is for the obstruction to increase and as the result of the effort of the portion of the large intestine proximal to it to overcome this obstruction, hypertrophy and dilutation take place. This is the factor which, in a majority of the more recently studied rases, has evidently been the determining one. In a small number of instances, hypertrophy of the transverse structions of the rectum have been found sufficiently marked to cause some obstruction. Other causes, such as spasm of the intestine, deficient innervation and congenital dilutation and hypertrophy, have been used to explain the condition when no anatomical basis for it has been found but they lack any contineing proof.

Though in some of the milder forms of the condition the symptoms may be delayed, they are usually seen in the first months of life. The characteristic symptoms are two: enlargement of the abdomen and obstinate constipation. The abdominal enlargement is chiefly due to distention of the colon by gas; it usually develops gradually and may become very great even in infancy. In marked cases the abdomen may be almost apherical. The greatest circumference is usually just about the navel. The distention is chiefly due to gas, although there may be a sufficient accumulation of fecal material to cause circumscribed duliness and marked resistance over the colon.

The constipation does not differ at first from that due to other conditions, but it persists and increases in space of all treatment. Later days, even weeks may pass by without an evacuation from the bowels. The frees are then usually dry, dark brown or grounds and very fool. Occasionally mucus and blood are passed and in the late stages of the disease there may even be discribes, the result of alteration. Marked peristaltic waves are almost always seen; they are usually in the lower part of the abdomen and on the right as well as on the left side. Pressure upon the abdomen is seldem painful and only to a slight extent unless some complication such as peritonets is present. By restall examination an obstruction to the finger is frequently encountered. It is frequently found that water may be injected, which is only expelled after a considerable length of time. The urine is usually normal except for the presence of indican in large amount.

Attacks of vonsting from time to time are not unusual, but in general the digretion is good. The condition may last for many years and may not be incompatible with normal growth. In very rare cases spontaneous recovery apparently occurs. Usually the condition becomes gradu-

ally some, the nutrition fails, there may be attacks of diarrhea with fever, or death may be due to some intercurrent infection, frequently of the longs. Perforative peritonitis is an occasional fatal complication.

The two conditions meet likely to be confounded with Hirschipping's disease are tuberculous peritonitis and chronic intestinal indigestion. Chronic intestinal indigestion is a relatively common condition. It occurs frequently as the result of some trank intestinal disease, usually in the second or third year. Attacks of distribus in most cases alternate with the constitution which is never so great as in Hirschipping's disease; nor is the distention, as shown by the X-ray, so extreme. Marked deep waves of intestinal perietals are solden seen. Chronic intestinal indigestion is seldem seen at the early age at which Hirschipping's disease is often found and the general condition of the child is always tod, while with Hirschipping's disease the general health may be exceljent for a long time.

Tuberculain perstaints is characterized by a more rapid onset, by the presence, oftentimes, of fluid in the abdominal cavity and of abdominal tumors, by evidence of tuberculosis elsewhere and by the preture of the von Pirquet reaction. Compared with the frequency of these two diseases, Herschappung's disease is a very rare condition.

The treatment of Hirschsprung's disease is pulliative so long as the general health remains good and without evidence of increase in the distention. It consists in careful feeding, occasional enemata and by the attempt, which is consettines successful, of overcoming the angulation of the intestine by preventing freal retention. In case the symptoms become more severe and the general health undermined, it is evident that obstruction is becoming more marked and operative procedure should be considered. Many different operations have been suggested; the only one which can be encessful is one that involves the entire removal of the obstruction wherever this may be. In the past the results have not been very satisfactory, but with increasing knowledge and experience, operative treatment is somewhat more encouraging.

INTESSUSCEPTION.

Introduception consists in the invagination of one portion of the intestine into another. It occurs most frequently in infancy, being at this age the most common cause of acute intestinal obstruction. The socident is not a common one, but the life of the patient generally depends upon its prompt recognition.

Varieties.—Usually the upper part of the intestine is invaginated into the lower, although the reverse is occasionally seen. Intustisceptions thay occur at any point in the intestinal tract. Those of the small intestine are called rateric; thuse of the colon, cafic; and those occurring at the ilescocal takes, ifeococal (Fig. 44). Of 30 cases under ten years of age, in which the variety was determined by autopsy or operation, 75 were fleococal, 9 colon, and 6 enterie. In the ilescocal form a few inches of the ileum pass through the fleococal valve, and then invagination of the colon occurs. Cases in which the ileum posses through the



Pro. 64 -- Innocense distributed printer. A operation removed from a shild in the New York Infant Applies.

valve, but without invariantion of the colon, are sometimes classed separately as an ileocalic carriely.

Leturanceptions of the dying, as they have been called, are met with in about right per cent of all autopases made upon infants; they are not often found in children over two years of age. They are descending, enteric, easily reducible, and multiple—neually from eight to twelve invaginations being present. They are more frequently in the jejunum than in the deam. They usually involve but two or three inches of the intestine, but may include ten or twelve inches. They are found in autopoies upon patients dying of all varieties of disease, and are

probably produced in the death agony. Such intuseusceptions are without symptoms, and are of no clinical importance.

Etiology.—Of 328 collected cases under ten years, the following are
the ages reported; under four months, 28 cases; from four to six months,
113; seven to none months, 71; ten to twelve months, 18; one to two
years, 32; two to ten years, 96. Three-fourths of the cases which occur
in childhood are, therefore, in the first two years, and enc-half of them
between the fourth and ninth months. The greater frequency in infancy
is attributed to the thinness of the intestinal walls, the greater mobility
of the occurs and ascending colon, and the presence of other intestinal
derangements at this age.

Males are more often affected than females. Of 268 cases in which the sex was mentioned, there were 174 males and 94 females. For this fact there is no explanation. The exciting causes of an attack are extremely absence. The great majority of cases occur in children who are apparently in perfect health. Some previous intestinal disorder was present in about three per cent of the cases we have collected—distribudysentery, colic, chronic indigestion, and constipation, all being mentioned. In four cases the intraspecuption was ascribed to injury of the philomen.

Lesions.—Nothnagel's animal experiments have shown conclusively that intusenseeptions are formed by the irregular action of the muscular walls of the intestine. They can be produced or released at will by varying the application of the electrical current. In the artificial intususception there is first a contraction of a certain part of the intestine, and if this ceases abruptly the normal gut below this point turns upward and folds over upon the contracted portion, thus forming a minute intus-

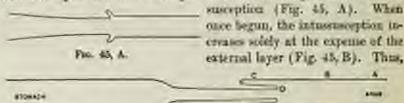


Fig. 45, B.-Machines or Intraspersion. (Trevel)

while the apex of the tumor D remains unchanged, the part of the sheath at A passes to B and then to C, so that the lower part of the intestine is drawn over the upper, rather than the upper crowded into the lower. The mechanism of the invagination was apparently the same when a part of the intestine was first paralyzed by crashing, as in the case in which a spasse of the intestine was first produced.

There is little doubt that pathological influousceptions are produced

in the same way as in these experiments. As the invagination takes place, the mesontery is drawn in with the bowel, and always lies between the shoath and the inner layer. To allow intusensception to occur, the meantery must be unally long, stretched, or lacerated. Its attachment to the spine cames the intussusception to describe an are of a circle, the contravity of which is always toward the spine. It also causes a purkering of the tumor. Invagination does not necessarily produce either obstruction of strangulation, but usually both are present, and are the chief causes of the symptoms. Traction upon the mesentery leads to obstruction in its resuels, causing congestion, adenu, hemorrhages, and over pargrene. Obstruction is chiefly due to swelling. It may be due to dragging of the mescatery, which brings the apex of the tumor against the side of the gut, or to bending of the introspeception. Introspeception is usually of all the costs of the intestine. We have, however, seen one, the exact nature of which was determined by operation, in which only the murosa and submucosa were intuited. The invagination was at the deocecal value. The symptoms were characteristic except for the absense of lumor.

The great cause of irreducibility in the first two or three days is swelling. We have several times seen at autopsy or operation an intussusception easily reduced, except the last two or three inches of the secum or items, which was swallen to the thickness of from a fourth to half an inch. Adhesions may prevent reduction, but rarely before the fourth day; they are often about as late as the sixth or seventh day. They are usually between the internal and middle layers of the intussusception, and are due to local peritonitis. In chronic cases, however, they form the principal obstacle to reduction. Other causes of irreducibility are twisting of the tumer and pinching of the prolapsed intestine, especially the deum by the decoral valve.

Gangrene and sloughing of the gangreness portion of the intestine occur much more often in acute than in chronic cases. Portions of intestine were passed per same in 24 of 362 cases under ten years, or about six per cent; but only two of these were in infants. Toward the end of the second week is the time when the separation of the sloughs is to be looked for. The amount of intestine discharged varies from a few inches to arrend feet. Two cases are on record in which the entire colon was passed, the patients recovering, but dying second months later from other causes. At the autopases the ileum was found attached to the lower part of the rectum just above the axis. In acute cases gangrene occurs about the upper end of the tumor, such the intestine usually cases away in one large mass. In chronic cases shreds of intestine may be discharged for several weeks.

Symptoms.—The clinical porture of a case of intususception is a

striking one, and when acate the symptoms are so uniform that, once seen, it can scarcely be averlooked a second time. The patient, usually between six and twelve months of age, is taken enddenly III with severe pain and vomiting; the pain recurs paroxysmally every few minutes, and the vomiting is first of the contents of the stomach, and afterward bilions. There may be one or two loose feeal stocks, then only blood or blood and mucus are passed without any admisture of fees. The general symptoms are those of great prostration, or even collapsepaller, feeble palse, apathy, and normal or solonormal temperature. The abdomen is relaxed. A tumor is usually persent in the epogastrium or the left iliae fosse, or it may be felt per rection. Later there is tympanites; the vomiting and pain continue; there is a steady increase in the prostration, and toward the end a rapidly riving temperature which may reach 104° or 106° F. before death scrurs from collapse. If the symptoms continue longer the signs of peritonitis are added. In subarate cases the onset is less abrupt, and pain; comiting, and constitution loss constant and less servere; but the same symptoms are present. In chaptic cases the coset is with vague, indefinite intestinal symptoms; pain, somiting and bloody discharges are usually wanting; there is progressive wasting and more or less diarrhea, but only the presence of the tumor leads to the recognition of the condition.

Onset.—Of 193 cases under ten years in which data upon this point could be obtained, the coset was sudden in 181 and gradual in 12 cases. By far the most frequent symptoms of onset are pain and vomiting. In a smaller number of cases the initial symptom is diarrhea or a discharge of blood and mucus.

Fair.—This is rarely continuous, but is intermittent, recurring in paratysms like those of endinary colle, but of great secenty. For pains in infancy are to be compared with it. The child sometimes shricks so as to be heard all over the house. Pain is a prominent symptom in over three-fourths of the cases, and is very rarely absent. It is generally more marked for the first two days, but may centime throughout the attack. In a few cases the pain is localized, being usually referred to the region of the umbilious.

Fomifing is more nurked at the onset, but may continue throughout the attack. Like the pain, it is more frequent in the acute cases. It is due to intestinal obstruction. Vomating is present in fully four-diffuof all cases. Usually it is persistent and often projectile. If food is given, vomiting often occurs as soon as it reaches the stomach. Storcoraceous vomiting occurs in about fifteen per cent of the cases in children under ten years, but is not common in infancy. It is rarely present before the third or fourth day. Although a had sign, it is not by any means a fatal one, as nearly one-half the cases in which it has been noted have recovered; it is to be regarded as indicating complete intestinal obstruction rather than strangulation.

Turner.—This is one of the most important symptoms for diagnosis because of its frequency and its peculiar character. It is present early in the disease, often in a few hours after the initial symptoms. The following table shows the frequency with which a tumor was present in the different varieties, and the position which it occupied in each. The anatomical variety was determined either by autopsy or operation.

The Relation between the Tumor and the Different Verieties of Intumusception in 185 Cases under Ten Years.

Region of occurs. Region of occurs. * innerenting color. * descending color. * sigmoid fleuere. Probuding from annu. Unshilled region. Movable. Site unknown.	Sout of Saturmentation.					
	Downsel.	fember	Critic.	Envir	Not Presod	Total
	313 4 25 9	\$ (12.4	17.1	1	7 12 13 18 18 18 12 12	11 13 16 21 15 61 22 1
Total No tumor felt	46 10	4 2		3	100	162

Tumor was thus made out during life in eighty-six per cent of the cases; and in the great majority of these it was discovered at the first careful exemination.

It will to noted that in nearly half of the cases the tumor was either felt in the rectum or protruded from the arms, and that in over twothirds it had advanced as far as the descending roles or beyond. The tumor may reach the rectum in a surprisingly short time, even when the invagination begins at the ileococal valve. In one of our cases it was felt in the rectum in less than twelve hears from the easet. The usual description, "samage-shaped," is accurate when the invagination is large, the tumor then being from four to six inches long and about an inch and a half in diameter. It is often curved.

During manipulation, or during an attack of pain, the tumer may become more preminent and may be distinctly erectile. To the teach the rectal tumor closely resembles the os oters, the central opening being the apex of the intresperaption. When pretruding from the body, the tumer is rarely more than two inches long. It is usually of a deeppurplish color, and may be gangrenous. If his been mistaken for prolapous ani, polypus, and even hemorrhoids.

Condition of the Bowels.—Bloody stocks are a very constant symptom. Of 186 cases under ten years in which the condition of the bowels was noted, blood in the stocks was present in accenty-six per cent. There are very often two or three thin, distribut movements, and then only blood and mucus are passed with no trace of feees and with no feeal odor. The amount of blood varies from a quantity sufficient to stain the mucus, to an ounce of semi-fluid blood. It rarely occurs without some mucus. Such discharges frequently follow attacks of severe colicky pain, and may occur several times in an linux. They may continue, or after a day or two they may be succeeded by absolute stoppage. Diarrhen throughout the attack is rare in children, particularly so in infants. It belongs generally to chronic cases. Constitution is complete in most of the acute cases, neither gas nor feess being passed—a fact which the discharge of blood and mucus may lead one to overlack.

Tenesimus is very common if the tumor is rectal. Relaxation of the aphineter is met with in a considerable proportion of the cases when the tumor is in the sigmoid flexure, or rectum.

During the first twenty-four or forty-eight hours the abdominal walls are soft and relaxed, and may even be retracted. Usually there is then little resistance to abdominal pulpation. After the second or third day there is usually tympunites; but this does not necessarily mean that peritonitis exists. Localized tenderness is a symptom of some importance when a tumor is absent. Scanty urine has been noted in a few cases, but is of no special value in showing the seut of obstruction.

In the acute cases the general symptoms are very striking. They are
the redinary case of severe shock—marked prestration, pallor with an
anxious expression of the face, general transmiter relaxation, cold extremities, cold perspiration, and often a subnormal temperature. Early there
is marked restlessesses, and even convulsions may seem. Later there is
apathy, dalness, even semi-stuper. The temperature during the first
twenty-four hours is usually not elevated, and is frequently subnormal.
Toward the close of the disease it rises rapidly to 100°, 104° F., or even
higher, quite independently of personnils. A rapidly rising temperature
is always a bad symptom, and usually betokens death within twentyfour hours. Wasting is seen in the chronic cases, and may be quite
rapid.

Course, Darmion, and Termination.—Of 198 mass under ten years, 155 were classed as armie, lasting less than seven days; 38 as subscate, lasting from one to four weeks; 10 were charmic, lasting over four weeks. Nearly all the cases occurring in infancy are sents.

Spontaneous reduction is, without doubt, possible in intususception.

Treves and others are of the opinion that this happens much more frequently than is generally supposed, and that many cases of severe college really cases of slight introducements. There are seen in both conditions the tendency to remit, the purosysmal pain, the constitutional depression, and often the sudden cassation of the symptoms, superially under the influence of opinm; but to make a positive diagnosis of invagination in such cases is impossible. Introducementary be cared spontaneously by slonghing of the invaginated part, the continuity of the intestine being preserved by adhesions. Such a result is rare at all ages, and is almost never seen in infancy.

The most frequent cause of douth in neute cases is shock. Peritonitie is not found at autopsy or operation so often as might be expected. In fifty-eight autopsics, it was seen lest twenty times, and in seven of these it was limited to the introsusception. In but seven cases was there perforation.

Diagnosis.—This usually presents no difficulty in acute cases provided the physician has the condition in mind. The great majority of such cases present nearly all the classical symptoms, viz., sudden onset, recurring celicky pains, frequent comiting, bloody and mucous elects without focal matter, general prostration or collapse, and low temperature. The records show that the most common error is to regard the case for the first few days as one of gastro-enteritis or ilsocolitis, the physicism's attention being engrossed by the runniting and bloody stools. Given the other usual symptoms, the presence of the characteristic tumor is conclusive evidence of intususception. Unless the patient is very much relaxed, a satisfactory examination is possible only under full meethesia. In any case of scute intestinal obstruction in infants, infusosception should first be considered. We once now in a young infant with strangulated hernia nearly every symptom of intrasusception except the abdominal tumor; in mother infant with an inflamed Meckel's diverticulum there was comiting, bloody and mucous stools and an elongated tumer in the hypogastric region. Cases of chronic introcuscotion present no diagnostic symptoms except the tumor. In both acute and chronic cases the rectal examination is most important for diagposis, and often settles the question at once,

Prognosis.—The prognosis of infraessessption depends upon the age of the patient, upon the variety of the disease.—whether acute, subscute, or chronic—and upon the time when proper treatment is begun.

There were collected by Piln in 1870, 94 cases under one year, the mortality being 84 per cent. Of 135 cases of the same age reported between 1870 and 1891 the mortality was 59 per cent. Besults in older children were somewhat more favorable. Formerly recovery was rare, except in cases with sloughing; but with earlier diagnosis and a better understanding of the proper methods of treatment, the mortality has been very much reduced. Combining the figures of Pilz with our own, there are 363 cases with 231 deaths, or 63.5 per cent.

Gilson (New York) has collected reports of 187 operations for intrasusception, with a general mertality of 51 per cent; in 126 cases, in which the tumor was reducible, it was but 36 per cent; in 61, in which it was irreducible or gangrenous, it was 86 per cent. The table following gives the mortality in relation to time of operation:

	Time of Operation.					
First di Second Third Fourth Fifth Steth	V	37 39 61 67 73 73				

After the second day the chances of success are greatly reduced.

Treatment.—The dugmosis of acute introspereption once made, lapurotomy should immediately be performed without an hour's immediately delay. The results following inflation of the intestine with air and injection with water are too incertain to be depended upon.

Operation should be looked upon as a measure which, if employed reasonably early, offers a good prospect of success. All statistics show that the result depends more upon the time when the operation is done than upon any other single factor. With earlier diagnosis and more prompt resort to operation, the mortality from acute intususception has, during the past fifteen years, been steadily falling. In chronic cases, also, laparotomy offers altogether the best chance of success.

CHAPTER IX

DISEASES OF THE INTESTINES.-(Continued)

APPENDICITIE

APPENDICTIES is met with at all ages, and is not especially a disease of children. When it attacks those over ten or twelve years of age it does not differ greatly from the types observed in adults. All that will be attempted in this chapter will be a consideration of the peculiarities of the disease as it is seen in children, particularly young children. For a fuller discussion of the disease as a whole the reader is referred to works on general medicine and surgery.

Etiology.—Of 1,000 cases of appendicitis personally observed by McCosh, 85 occurred in children between the ages of ten and fifteen years; 51 between the ages of five and ten years, and only 17 under five years; of these but 4 were under two years. Churchman's figures from the Johns Hopkins' Hospital, in a total of 1,223 cases, give only 2 cases under five years, and 50 between five and ten years. In infancy and early childhood appendicitis is, therefore, a relatively rare disease. The youngest case that has come under our observation was in an infant of ten weeks. Operation was done and recovery followed. Appendicitis in young infants has been reported by Goyen (six weeks), Shaw (seven weeks), Demme (seven weeks) and Savage (nine weeks). The predominance of the male sex helds true even in childhood. Of 101 cases under fifteen years, 72 were males and 29 were females.

Regarding the exciting cause of an attack but little is yet definitely known. In only a very small proportion of the cases is a foreign body discovered in the appendix. In one of ours a pin was found, and a number of similar cases are on record. There is, however, often a fecal concretion which is moulded into the shape of a foreign body, and formerly was often regarded as such. This probably has some relation to the attack by causing disturbances of circulation and increasing the chances of infection. Still and others have called attention to the frequent occurrence of pin worms in the appendices of young children. There is abundant reason for believing that these may at times be the exciting cause of an attack. The bacteria most frequently found in abscesses from appendicitis are streptococci, usually associated with colon bacilli.

Lesions.—All the common varieties of scute appendicitis,—the catarrhal, supportative, and gasgronous,—are met with in children; and, much
less frequently, the chronic form. The lesions present few peculiarities
in early life except that, owing, possibly, to the relation of the appendix
to the ementum, perforative inflammations are less likely to be circumscribed by inflammatory products and much more likely to result in a
general peritonitis than in adults. Whether or not this be the correct
explanation, it is certainly true that general peritonitis is a much more
common sequel than in adults. Another point of some importance is
the fact that in early life the appendix is rather more frequently found
out of the usual position. The inflammation excited by pin worms is
usually a superficial one; perforation and abscess formation are almost
unknown when they are the cause.

Symptoms.-In many of the cases the familiar symptoms of appen-

dicitie-tumiting, localized pain and tenderness, muscular rigidity, abforminal distintion, and fever-are all present, and the diagnosis is easy. But in perhaps the larger number the disease is irregular in its onset, incidious in its course, and presents at times great difficulties in diagnosis. This is particularly true of appendicitis in children under five years. Veniting is probably the most constant symptom; it is selden absent, and usually percestent. If accompanied by pain and constitution, appendicatis should at core be thought of. Pain, though nearly present, is often indefinite; it is generally hard to bealize and difficult to interpret. It may be referred now to one and now to another part of the abdomen. Often the only evidence of pain is restlesoness, irritability, and, in infants, frequent crying. Tendernose is even more difficult to elicit than pain. Young children, especially if norvous and sensitive, shrink from any teach, and the results of abdominal palpation may be most mustliable. In others of a different temperament positive information may be obtained. In any child under three years, it is almost impossible to make out localized tenderness. The same is true of muscular rigidity. Only with the greatest amount of fact and by diverting the patient, can any information be derived from this part of the examination. Tenderness and movular rigidity are sometimes shown by the child's disinclination to move either the trunk or lower extremities and by evidences of pain when he is moved by mother or nurse. When accounted with vemiting, fever, and constitution, such symptoms are always suggestive.

Constitution is usually present, but by no means so regularly as in adults. Diarrhea is not at all uncommon, and, when associated with comiting, tends to divert attention from the appendix to an ordinary gastro-intestinal attack. Abdominal distention, when present, is of much importance, taken with other symptoms. Fever is rather more apt to be high than in adults. But there are many exceptions, and, on the whole, the temperature is a very untrustworthy guide either to diagnosis or prognosis. The bracocyte count is of much assistance in diagnosis, at least in supenrative forms of appendicitis. A lencocytosis of at least 10,000 to 20,000 is mustly present, with a polymorphounds ar percentage over 75. Some special symptoms may be seen in appendicitis which are quite misleading. We have on several occasions seen frequent mistorition and other marked manifestations of verteal irritation, owing to the position of the appendix behind the bladder. Pain just before and during defecation is occasionally a striking symptom especially with infants. The rigidity of the thigh flevors seen in cases of appendicitis, which rames an with subscate symptoms, may give rise to lameness strongly suggestive of disease at the hip.

Course of the Disease.-A certain number of cases begin with definite

symptoms-pain, vomiting, fover, and constipation-and continue with slowly or rapidly advancing symptoms to increasing prestration, continued vomiting, constipution, most judse, abdominal distention, rigidits, higher temperature, and death by general peritonitis at the end of five or seven days' illness. Others, with a similar onset, show a gradual abatement of all acute symptoms after a few days, and recovery at the end of ten days or two works, followed, perhaps, for another attack after a few months. These types are seen in children as in adults. But others are quite common. A child may be taken ill, sometimes abruptly, sometimes more gradually, with vomiting, which is repeated several times in a single day, afterward only occasionally. There is some pain; it is not very definite and not localized. The prostration is only moderate, the temperature not over 1000 or 100.5° F. The examination shows little. Tenderness can not be definitely made out; the child is irritable, fretful, wishes to be left alone, and resists all efforts at abdominal palpation. The barrels are constituated, or they may be at first. loose and afterward constiputed. The stilld does not seem very sick. The attack is probably regarded as an ordinary one of acute indigestion. But things do not improve as they ought. The pulse becomes more rapid, the prostration greater, and the chief begins to look seriously ill, though the temperature has not risen. The abdominal distention is now considerable and tenderness undatabled. An operation is decided on, and there is found a gauge-nous appendix and a diffuse general peritonitis. Sometimes the grave symptoms develop with great rapedity in the course of a few hours, when previous symptoms had all been mild; sometimes so insidiously that the transition is almost imperceptible.

Programs.—The programs in young children is not good; of 132 reflected cases in infants and very young children the mortality was 38 per cent. But in these over seven years old the outlook is rather better than in adults. The results depend much upon early diagnosis and proper treatment. General peritonitis, it is generally agreed, occurs much oftener in children than in adults; it is the come of death in about 80 per cent of the cases. 807-43 fatal cases, nearly all of them from general peritonitis, only 6 died during the first three days, 13 from the fourth to the seventh day, 13 in the second week, and 5 in the third week. If general peritonitis occurs, the chances of recovery after operation are, however, usually better with children than with adults.

Diagnosis.—The diagnostic symptoms of appendicitis are a sudden onest with comiting, sharp pain in the abdomen, and persistent acute localized tenderness in the right iline fossa. Eightily of any or all of the abdominal muscles is also significant. Constipation is more frequent than distribut, though the latter is not rare. There is almost invariably some elevation of temperature, but not often high freez.

Appendicitis may be confounded with colic, indigestion, and in infants with infusensception; in older children with absresses due to proitis. Colic is distinguished by the absence of localized tenderness and fever, by its short duration, and by the fact that the pain is generally less intense. Severe colic with fever in children over three were old should, however, always he regarded with suspicion. From acute indigestion the diagnosis of appendicitis is difficult at the onset, and it may be impossible for tweaty-four hours. However, the pain of imbigestion is rarely so severe, while the fever is usually higher. It should be remembered that the pain in appendicitis is not always localized, nor is the tumor always in the right iliac fossa. The presence of pain, waniting, and localized tenderness, and the greater severity of the constitutional symptoms, indicate appendicitis. We have several times known the phearisy accompanying pneaments at the right base to be mistaken for appendicitis. With this there may be romiting, severe localized pair, and sometimes also localized tenderness. Cyclic vomiting is distinguished by the history of previous attacks, the greater frequency with which the vomiting occurs, its alrupt resultion after twenty-four to seventy-two hours, the sunken abdomen, and the absence of pain, tenderpess, and rigility. The presence of early acetonuria in also characteristic. Intussusception, with its pain, colic, and voniting, may auggost appendicitis, but is rare, except in infants; fever is absent eatls in the disease, and a tumor is arrually present. Acute or su'morte supportation in the right illier fossa is almost invariably due to appendicitis.

The leucocyte count may be of considerable assistance in differentiating appendicitis from colic, syrlic vomiting, ilescolitis, and intraspection. It should, however, be remembered that in some of the gravest cases the leucocytosis may be slight or there may be near at all. On the whole, while the presence of marked leucocytosis—i.e., above 20,000—may be of considerable assistance in the diagnosis, no inference out be drawn from a normal count or a slight leucocytosis if the child is greatly prostrated. Whenever, in children over two years old, there are symptoms pointing to acute peritonitis, no matter what their combination or variety, appendicitis should always be suspected.

Treatment.—Absolute rest in bed can not be too enough ineisted upon whenever appendicitis is suspected, no matter how mild the attack may appear. As a local application, the ice-lag is to be preferred. Opinm should not be given. It does barm by obscuring important symptoms and increasing constipation. The colon should be kept empty by the daily use of enemata. After a thorough clearing of the bowels in the beginning, preferably by a saline, cathartics are to be avoided.

Appendicitis is a surgical disease, and surgical advice should be

sought early. In deciding as to the time of operative interference, it should be remembered that localization of the inflammation is less likely to occur with chaldren than with older patients and that therefore the dangers of general peritonitis are much greater; that the progress of the disease is much less regular; that grave conditions are not revealed at once by grave symplems; that the disease is an insidious one, and that to foretell the outcome even in the middest cases is impossible. Taking all these things into account, we believe that immediate operation, once the diagnosis is made, is the course to be recommended in all cases of scute appendicitis in children. The younger the child the greater the urgency for operation.

INTESTINAL WORMS

Judging by published reports, intestinal worms are much more common in Europe than in the northern part of this country. In 18,000 patients treated for medical diseases in our dispensary services in New York and Baltimore there was positive evidence of worms in but 135 cases. Of these, 20 had tapeworms, 55 round worms, 56 thread worms and 4 both round and thread worms. In private practice among the better classes, worms are certainly rare.

Cestedes—Tapeworms.—Cestedes are usually introduced into the body by the ingestion of some form of food containing larvae (cysticerci). The larva of the temia soliton is most frequently found in pork; that of the temis wedisconsillate in beef; that of the bathrisrepholes lates in fish; that of the temis excurseries inhabits dog of cal lice, being introduced into the intestinal tract accidentally by the bands. Several varieties of temis are found in the human intestine.

Teyra Saunata on Medicanniana—Berr Tarkworm.—Infection results from eating raw or partially cooked beef containing systicered. The worm is from twelve to twenty feet in length, and has a square pigmented bend without books but provided with four suckers. The full-sized segments are from suc-half to three-fourths of an inch long and about half as wide.

Testa Soldies—Pork Tarrworm.—This is a rare form in children, and comes from eating raw or partially cooked pork or sausage. It is from six to ten feet in length, the segments being nearly square. The head is about the size of a mustard seed and is pigmented. It also is provided with four suckers and a proboscie, surrounding which is a carele of about twenty-sex booklets.

TESTA COCCURRINGS On EGALPTICA.—The largue of this form developin a louse found on the skin of dogs and cuts. Children who play with infected animals are the ones affected, the parasite being conveyed to the month nutsily by means of the hands; it may thus be found even in young infants. This form of build is much smaller than either of the preceding varieties, the full length being only from six to twelve inches.

Bornizoccemants Lavon.—This is a rare form except in the sea countries of northern Europe and Switzerland, where it is said to be very remain. The larvae are harbored by cortain fish, by eating which when insufficiently cooked they are introduced into the body. The fullgroup weem is from twenty-line to thirty feet in length.

Taxia Naxa.—The tenia nons, or dwarf topeworm, is the smallest of all the creticles. It is a curron norm of one-half in three-fourths of an inch in length, and is composed of one hundred to two hundred segments. It has a stender neck and globular head which contains four suckers and twenty or thirty booklets. The habital of the mma is the upper part of the down where it is often found in immense numbers. A single stool may contain several hundred worms. The ova have two definite membranes within the inner one of which three pairs of hooklets are found. The cyclocerus stage of this parasite is not known. It is probable that infection occurs from availawing the syn themselves. As a similar parasite inhabits the intestinal tract of rate and mice it is possible that these animals play a part in transmission, From the observations of Schloss it usems probable that in the ricinity of New York this is the most frequent intestinal parasits of childhood.

Samplant,-The only positive evalence of tapeworm is the discharge of the worms or separated segments, either singly or in groups. Occasionally worms pass into the stomach and are comited. Various abdomiand symptoms may be associated with worms, but most of these are very indefinite in character and are more often due to other causes. The most frequent symptoms are had breath, various ampoving sensations, colicky attacks, inonlinate or expercious appetito, and diarrhea. Usually, if the patient is in good health, no constitutional symptoms are seen. Sometimes, particularly with the botherocephalus latus, there is a very grave degree of memis. The increase in the number of seeinophile cells in the blood is of considerable diagnostic value. They frequently form from four to ten per cent of the lenescytes, while in normal blood the usual number is less than two per cent. Many cases are on record, some of them in children, in which the symptoms of pernicious amenia have been present and have disappeared after the expulsion of the tapeworm. Xervous symptoms are not so often seen as with roundworms, and will be discussed in connection with them.

Trailment.-Prophylasis requires the cooking of ment to a sufficient degree to destroy the cysticore. There is especial danger in eating raw peek or sunsage; that from rare beef is much less. The list of drugs used for the expulsion of the worm is a long one; probably the most efficient to the obcorosin of mule form; it is, however, difficult to administer and it is very likely to provoke vomiting. It may be given in capenles containing \$\mathbb{Q} \times to \$\mathbb{Q} \times x_1 or in an emolecular made up with simple clixir and seasis, in which II v to III x are contained in one dram. For a child of four years at least one dram of the male sera should be given in the course of six to eight bours. The termifuge should be preceded by several hourst fasting, and the howels previously opened by a laxative. The following plan of administration has been found satisfactory: a light supper of milk, and in the morning a saline faxative on rising, but no breakfast; after the saline has acted freely the remedy is to be given, and following the last does, half an ounce of center oil or some other active purge. The effect of the esthurtic is nided by a large injection of warm wap and water. Only milk should be given that day. The fragments passed should be carefully commised to see if the head has been expelled, as the worm is very likely to be broken at the neck. If this occurs it will grow again, and in about three menths argments will appear in the stool. Other drugs useful for tenin are pumpkin seeds which are given in powdered form, infusion of pomegranate rest, turpentine, and chloroform.

Nematodes.—Three varieties are found in the intestinal canal, the accurate fundricoides, the asymmic remaindaris, and the excineria Americana.

Ascants for mannounces—Roundworm.—This worm is usually found in the small intestine. It is much more frequently not with in children than is the tapeworm. It is exceedingly rare in inflatey, but is usually seen between the third and tenth years. In over two thousand autopoies upon infants we have only twice found a roundworm in the intestine.

The reindwerm resembles the ardinary carthworm; it is from five to ten inches long, the female being longer than the male. It is of a light gray color with a slightly peakish tint, cylindrical, and tapering toward the extremities. The eggs are coal in form, about gla inch in diameter, and numbered by millions. These worms rarely exist singly; usually from two to ten are present, but there may be hundreds. When very manerous they coil up and form large masses, which may cause intestinal obstruction.

The migration of these worms is rurious, and in some instances truly remarkable. They frequently enter the stomach and are vonated. Occasionally one may appear in the now. They have been known to pass through the Eustachian tube into the middle our and to appear in the external meature. Entering the largust they have produced fatal asphysia. It is not very rare for them to enter the common hile duct and produce jaundice. They may even enter in great numbers the smaller hile ducts and produce hepatic abscesses. They have been found in the pancreatic duct, in the vermiform appendix, and in the aplenic twin. It has long been known that they would perforate an intestine which was the sent of ubscration, but well-authenticated cases have been reported in which they have perforated an intestine previously bealthy, setting up a fatal peritonitis. In Archambault's case they perforated the stomach. In cases of a persistent Meckel's divertimions, worms have been discharged from an umbilical fistula. They have been found in umbilical abscesses. Considering, however, the frequency of roundscorms, ingrations are rare.

Symptoms.—The symptoms of reinsbustness are of the most indefinite kind; often there are none until the worm is discovered in the stocks. It is then fair to assume that other worms are also present. The most frequent abdominal symptoms are celle, tymponites, and other symptoms of indigestion, loss of appetite, disturbed sleep and grinding of the teeth at night. These symptoms are much more frequently due to other causes than to worms, but when all are present the existence of worms should be suspected.

A great variety of nervous symptoms may be associated with intestinal worms. They are more often seen with lumbricoids than with either of the other varieties. The symptoms may be of the most profing character, and may simulate very closely those of serious organic discase. There may be profonged low fever, chills, headacke, vertigo, influcimations, hysterical sciences, epileptiform attacks, convulsions, tetany, transient paralyses such as strabismus, and even hemiplegia and aphasia. All these have been observed in connection with intestinal worms, and from the fart that the symptoms disappeared completely after the worms were expelled, there seems to be but hitle doubt that they were the cause of the symptoms. As in the case of the abdominal symptoms, however, intestinal worms are only one of the causes of such nervous disturbances, and certainly not a frequent one; but the possibility that nervous disturbances may depend upon worms should not be overlooked. The blood generally shows cosmophilia, as in patients with tapeworm.

The only positive evalence of the existence of roundworms is the discharge of a worm from the body, or the discovery of the row in the stock. A microscopic examination of the stools is a valuable means of diagnosis, and one that is too infrequently employed. When worms are present the overmany be found in great numbers. Their continued presence, after the discharge of one worm, indicates that other worms remain.

Treatment.—An efficient agent for the removal of the worms is santonin. The same plan of administration may be followed as in the case of the tapeworm, viz., to give the drug on an empty atomach, preceded by a laxative. Santonin is best given in powdered form mixed with sugar. For a child of five years as much as three grains are usually required. This amount should be given in three doses at intervals of four hours, soon followed by a purpe of caloniel or easter oil. Oil of abenopedium is somewhat easier of administration and is quite as efficient. It may be given as described under the treatment for Blookwarm. The great difficulty with santonin is its tendency to provoke vomiting. Occasionally, in susceptible children, even with ordinary doses, toxic symptoms may develop, such as yellow vision, dark-red or yellow urine, and nervous excitement or delirium.

Oxyums Vimmeulanis—Privious Theranworm.—The oxyums resembles a short piece of white thread. The female is about one-third of an inch long, the male about one-half that length, but is less frequently seen. The worm tapers toward the tail. The over are of slightly irregular size, and are considerably smaller than those of the round-worm.

The oxyuris inhabits the rectum, the eccum, and, according to Still, very frequently the appendix. These worms may be found also in the lower small intestine, in the stomach, and even in the month. If present in the rectum they are usually discovered by separating the folds of the anus. The number of worms is usually large. The irritation to which they give rise causes a great production of mucus, and frequently leads to a chronic entarth of the colon of considerable severity. The worms are imhedded in the mucus; often they form with it small balls. According to Leuckart, they are incapable of multiplying in sifu. Doubt has recently been thrown upon this view by the observations of Still. From the immature character and the large numbers of the worms found in the appendix (111 in one case), this writer believes that the appendix may be a breeding place. The ora as well as the worms are passed in enormous numbers with the stools. They attach themselves to the folds of the skin, the hairs about the arms, and even to the genitals. The patient may, through lack of cleanliness of the parts, continually re-infect himself. After discharge from the body, the sou may be carried by flies and deposited upon fruits, vegetables, or in drinking water.

Symptoms.—The principal local symptom caused by the expuris is itching of the znus or the genitals. This is caused by the migration of the worms from the heavel, and usually comes on at about the same hour at night, generally seen after the patient has retired. It is sometimes so intense as to be almost intelerable. It leads to frequent micturition, to incontinence of urine, in the mule to balanitis, and in the female to vaginitis or vulvitis, and in both, but especially in the latter, it may be the cause of masturbation. Owing to the catarrhal colitis which is ex-

sated, there is discharged from time to time a large quantity of muchs. Severe collecty pains are often associated. The irrelation may lead to prelique and. Necessary symptoms are not so frequently associated as with the other varieties of worms, although we have seen at least one case of chores in which they were almost certainly the cause. They have been known to excite controlsions. The general health is sometimes undermined and there may be marked and progressive loss in weight.

Treatment.-This is usually spoken of as a very simple matter, and no doubt in recent cases, or where the number of worms is small, this is true; but where the number is large, and considerable catarrhal inflammation of the colon is present, it is often a matter of the greatest difficulty to rid the boxel of these parasites. Cases frequently resist treatment by injection for months, even though thoroughly used. The reason for this is, that only the lever colon is reached by injections while the worms may be chiefly in the cornt or even in the appendix and small intestine. While, therefore, injections are important and indeed invaluable, they can not be relied upon exclusively. The most ecrapulous attention to elembross is an absolute necessity as the first step in the treatment of all cases. It is well to bathe the parts about the anus after each stool, and even two or three times a day, with a bichlorid solution, I to 10,000. Hehing is lest controlled by the application of mercurial cintment to the folds of the arms at bedtime, this effectually preventing the escape of the worms from the borod. The local application of cold will sometimes have the same effect. The most efficient of the injections is probably the bichlorid. The colon should first be thoroughly cleaned by an injection of lukewarm water containing one tempoonful of borny to the pint, in order to remove the mucus. When this has been discharged, half a pint of the bichloral solution of the strength mentioned should be injected high into the lowel through a valleter, and retained as long as possible. This should be repeated every second or third night. other nights a simple saline injection may be employed. The infusion of question, asafetida, alors, and gartie are also useful. Solutions of earlolic acid should never be employed.

When the worms are high in the colon, drugs by the mouth must be combined with injections. The most efficient remedies are sandsain and the oil of cheropolium, which may be used as for roundworms. The expulsion of the worms is asked by askine entharties; simple bitters, such as gentian and quastic, are also of some value. We have known are case, which resisted for most two years everything which had been tried, to be cared in two or three weeks by injections of a detection of garlic, in connection with which garlic was given in liberal quantities by the mouth. Uncornanta Americana or Hospitology.—This belongs to the class of nemitodes. The males are one-fourth to one-half inch in length and the females slightly longer. The purasite resembles the anhyloctomuse disoferate of Europe. Infection usually takes place through the skin of the bare feet, more rarely that of the hands. It is possible, however, to contract the disease by eating dirty fruit or vegetables contaminated by the developing larvae; but infection does not occur from swallowing the ova or young larvae. After entering the skin the larvae find their way into the circulation and thus reach the lungs. From the lungs they may migrate or be coughed up into the month and then swallowed. They are not acted upon by the gastro-intestinal secretions, and in the upper part of the small intestine they develop into mature worms. These may exist in the small intestine for years.

The symptoms in the milder cases are mirror digestive disturbances, general malnutrition with moderate anemia and arrested growth. In the more severe cases the anemia is very marked, the hemoglobin often falling to thirty per cent or below. The lenescytes are normal in number or slightly increased; but the percentage of cosinophiles is about the normal. In most patients the proportion reaches five or ten per cent; it may however be twenty-five per cent or even higher. Edema of the face is common and there may be general dropsy without albuminaria. Affected children besides being very backward in physical development, are shall, inattentive and entirely wanting in physical or mestal energy. The appetite is sometimes absent; but more characteristic is the craving, not only for every kind of food, but for such articles as clay, dirt, chalk, etc. Death may be due to the progressive failure of nutrition or to intercurrent disease.

Prophylaxis in the individual consists chiefly in the protection of the feet of persons living in an infected district, by wearing shoes. The chief remedy for the hookwarm is thymol. Its administration should be preceded by one or more full doses of the sulphate of magnesia or soda given after twelve hours' fasting. The quantity of thymol given to a child of five years should be six or eight grains in divided doses in the course of three or four hours. It may be administered either in capsule or in suspension. Two hours after the last dose, the salts should be repeated; but no food should be given until the enthartic has acted freely. Castor oil should not be used. A repetition of the treatment is often necessary before a cure is accomplished.

The oil of chemopodium is apparently quite as effective as thymoland has the afrantage of being much cheaper. It may be administered dropped upon eigar. The smual desage is one drop per year of age upto ten years. A dose of Epsom salts is given on the preceding day and three doses of the oil at two-hour intervals the next morning, the last dose to be followed by castor on. It should be remembered that chemppolism is toxic in over doses.

CHAPTER X

DISEASES OF THE RECTUM

PROLAPSUS AND

Unner this term are included two conditions. In the first, or partial prolapse, there is simply an eversion of the muous membrane which protrudes beyond the sphincter. In the second, or complete prelapse, there is invagination of the rectal wall for a variable distance, usually two or three inches.

Etiology.—Prolapse is most common in children during the second and third years. Its frequency in early life is partly due to the lack of support furnished by the levator-ani muscles. It also occurs very readily when the ischiorectal fat is scanty; it is therefore often sen in children suffering from marasmus. The exciting cause may be anything which provokes severe and prolonged straining. This may be either the tenesmus accompanying inflammation of the rectal muccus membrane or chronic constipation. It may come from phimosis or stricture of the urethra, and it is a very frequent symptom of stone in the bladder.

Symptoms.—Prolapse usually occurs during the act of defecation. It is generally easily reduced, but shows a great disposition to return with every stool. In obstinate cases the bowel comes down at other times. The appearance of the tumor varies with its size. In the slighter form there is simply a ring composed of a fold of mucous membrane surrounding the anns. In the more severe form there is a flattened, corrugated tumor, usually about the size of a small tomato. The mucous membrane covering the tumor is of a fleep purphish-red color, and bleeds readily. It may be the seat of catarrhal or membraness inflammation. The diagnosis in most cases is easy, although the tumor has been confounded with polypus and intussues experient.

Treatment.—In most cases reduction is easily accomplished by laying the child upon his face across the lap, and making gentle pressure upon the tumor with eiled fingers. The application of cold, either by means of ice or cold cloths, is of assistance in cases which are not at once reduced by pressure. After reduction, in the milder cases the child should be kept upon his back for at least an hour. When the tumor tends to come down with every stool, special attention should be given at this

time. If an infant, the bowels should always more while the child lies upon his back, and during defecation the buttocks should be pressed together by a nurse. Older children should use an inclined seat placed at an angle of about forty-five degrees, but should never sit upon a low chair or assume any position in which straining is easy. After defecation the patient should lie down for at least half an hour. When there is constitution, the horsels should be kept free by means of laxatives. If there is diarrhes, tenesmus may be overcome by frequent sponging with ice water, or by the use of small injections of ice water and tannic arid, in the proportion of twenty grains to the ounce. In more severe cases it may be controlled by the use of suppositories of opium. When the hourd tends to come down frequently, this may be prevented by the use of an adjective strap two or three inches wide, placed tightly across the buttocks. This is better in the milder cases than a T-bandage. The great majority of the cases are cured by these means in the course of a few weeks.

In the most severe cases the bowel not only protrades during defecation, but also in the interval, and it may be down for days at a time. Such cases are rarely seen except in infants who have very flabby muscles, and but little adipose tissue at the floor of the pelvis. Reduction is sometimes difficult in cases when the prolapse has lasted a long time. It is often facilitated by painting the protreding part with a solution of epinephrin, and then dilating the splincter by passing the fuger into the central opening of the tumor. After reduction, suppositories containing from one-fourth to one-half grain of cocain may be inserted. They are more efficient than those containing optim or belladenna. A firm pad should be applied over the zons, held in position by a T-lumlage. For several days at a time a short rubber tube may be kept in the recturn, held in place by nelliesive plaster. The bowels should be kept freely open. Where all other measures fail, the protriding part may be touched with the Panuelin cautery, linear markings being made at interrals of an inch. Amoutation or excision is not required in children.

PISSURE OF THE ANUS

This is not a very uncommon condition in children. The most frequent cause is the passage of a large, hard, fecal mass. Sometimes it results from transmitten inflicted with the nearle of a syringe while giving an enema. It may be produced by the scratching excited by pinworms. In the beginning there is a simple tear at the margin of the anus. The laceration which is produced usually heals promptly; but if the cause is repeated, healing is prevented, and there is finally produced

a linear sleer, or a true fissure, which may last for some time and be

a source of great annoyance.

A fresh fisture has the appearance of any other tear at a miscoculaneous critics. One of longer standing has a gray base, slightly indurated edges, often discharges a small amount of pas, and bleeds a drop or two with nearly every movement of the boxels. The most constant symptom is pain, which mostly occurs with the act of defecation and continues for some time afterward. It is most severe when the fiscure is just at the margin of the sphincter, and leads the child to resist every inclination to have the brorels more, so that it becomes a cause of chronic constipation, which condition again greatly aggravates the fiscure: The pain is often referred to other parts in the neighborhood.

The treatment is simple and usually efficient. It consists in resultiness, overcoming the constipution, and tenching the fissure with nitrate of silver, preferably with the solid stick. If the case is not speadily relieved by such measures, the sphincier should be stretched as in adult patients.

PROCTITIS

Proctitis, or inflammation of the rectum, usually occurs with inflammation of the rest of the large intestine, but it may accur alone. It is to the cases in which only the rectum is involved that the term is pen-

erally applied.

The names are for the most part local. A frequent one in infants is the use of irritating injections or suppositories, either for the relief of constipution or as a means of administering certain drugs. We have seen one obstitute case in an infant a year old, following the prolonged use of glycerin suppositories. It is sometimes caused by transmitten, especially by the carefess giving of an enema. It accompanies pinwerms. In certain cases it may result from direct infection through the anus. This may be from a genecoccus inflammation satending from the vagina or wrethra, or from an infection due to other bacteria, particularly in cases of measles, scarlet fever, and diphtheria; or, finally, it may be due to syphilis. Practitis may be entarrhal, membraneous, or ulcerative.

Catarrhal Proctitie.—The pathological conditions are the same as in ordinary exterrial inflammation of the intestinal muscus membrane. By the introduction of a speculum, or by simply everting the muscus membrane, it is seen to be reddened, swellen, and bloods maily. There is a copous secretion of mucus. In cases of long standing there may be superficial alteration appearing as a white or yellowish-white surface, namely just inside the sphinctor.

The symptoms are chiefly local, although a condition of general irri-

tability may result from the local condition. There is heightened reflex action, so that the stool often comes with a sport. There is pain with defecation, and mucus is discharged, usually as a clear, jelly-like mass, and sometimes in the form of a cast, but not generally mixed with the stool. There are usually traces of blood, sometimes quite large hemorrhages. In the most arute cases, teasures is present both during and after the stool. There may be prolapsed unit. The skin in the vicinity is irritated by the discharges, most frequently so in infants. If the cause is pinworms, there may be intense itching. The duration of the discase is indefinite, depending upon the cause. It may be a few days or many months. The inflammation may extend from the rectum to neighboring parts, leading to ischiorcetal abscess.

Membranous Proctitis.—It has been customary to describe this as a complication of diphtheria, usually occurring with diphtheria of the external generals. As few of these cases have been studied factoriologically, it is impossible to say what proportion of them, if any, are to be regarded as true diphtheria. When the infection is from the intestine above, the rectum is never affected above. When it is from below, this may be the case. The lesions are the same as in membranous inflammation occurring higher in the colon. The symptoms resemble those of the cutarrital variety with the addition that the stools contain pieces of pseudo-membrane. This can be made out only by repeatedly washing the discharges with water. If accompanied by prolapse, the pseudo-membrane may be seen. Membranous proctitis may be complicated by a membranous inflammation of the genitals or the perineum. Although it is usually neate, it may last for weeks,

Ulcerative Prectitis.—Ulcers of the rectum may be the result of a catarrhal inflammation; those, however, are usually superficial, affecting the mucous membrane only, and in most cases beal rapidly. Sometimes they extend more deeply into the submuceus or even the muscular cost. They are then chronic, after very obstinate, and may last indefinitely. Follicular alcers of the rectum are nearly always associated with the same condition in the sigmoid flexure. These are always multiple and norally small, rarely being more than a quarter of an inch in diameter. Semetimes the small ones coalesce, producing much larger alcers. Single alcers may be of tuberculous origin. Syphilitic alcers are extremely rare in children.

The symptoms of alese of the rectum are mainly two—pain and hemorrhage. The pain is of variable intensity, and may be referred to the coreyx, or to any of the neighboring parts. The amount of bleeding may be small, the blood coming in clots, or it may be fluid and in so large a quantity as to pendisc general symptoms. It usually accompanies every shoot. In addition the stool contains more or less pus, par-

ticularly in chronic cases. When the ulter is low flown, tensions is usually present and may be a prominent symptom. The duration of the symptoms is indefinite; often they last for many months and lend to a marked deterioration in the general health. A positive diagnosis of nicer can be made only by examination with a speculum,

Treatment.—In cases of acute cutarrial proctitis injections of some bland fluids should be employed, such as a starch-water, limewater, a mixture of oil and limewater, or a warm one-per-cent saline solution. The local cause, if one exists, should be removed. In the most acute cases the patient should be kept in bed. When the tensors is severe, suppositories of opium may be used. In the more chronic cases saline injections should be given, and followed by a mild astringent like tannic acid, ten grains to the cunce, or a one-per-cent solution of hamanells. Cases associated with pinworms are especially obstinate. Here the treatment is first to be directed to the worms, and afterward to the procities.

In the membranous cases the same measures are to be employed, and in addition the injection of a warm boric-acid solution two or three times a day.

Cases of ulcer require the most careful treatment. In many there is but little tendency to spentaneous recovery. An examination with the speculum should be insisted upon in all cases of chronic proctitis, to make sure of the diagnosis. Rest in bed is resential to a rapid improvement. The bowels should be kept freely open by the use of laxatives and injections of a boric-acid solution, or one or two ownces of liquid alkelens may be injected every night and retained. If this does not relieve the patient, a weak solution of notrate of silver (one grain to the ornes) may be injected daily after washing out the bowel with topid water. If a stronger solution than this is used, it should be neutralized after half a minute by the injection of a saline solution.

ISCHIORECTAL ABSCESS

This is not a very rare condition even in infancy. Infection from the rectum, usually through the lymph channels, seems to be the most common cause, although sometimes the abscess may be traced directly to transmission.

Essentially the same varieties of inflammation are seen in early life as in adults. Most of these cases recover promptly after simple incision and cleanliness, fistula being a rare sequel.

RECTAL POLYPUS

Polypi are rarely seen in children, but, when present, may be the sause of eather obscure symptoms. The most important one is hemorchage. This at first occurs at intervals of days or weeks. The amount of blood list is from a dram to an sunce or more. Later, the hemorchages become more frequent and may be almost continuous, although rarely profuse enough to produce serious symptoms. The diagnosis of polypus is made only after a local examination. Sometimes the tumors are within the reach of the fluger; in other cases a procloscope must be employed. Spontaneous cure often takes place by the sloughing of the tumor, after which the bleeding soon reases. In other cases operation is necessary.

HEMORRHOIDS

These, fortunately, are not often seen in children, although they occur in these as young as three or four years, and in some cases may even be congenital. The principal cause is chronic constipation, rarely diarrhea. The tumors are generally small and external, the chief symptom complained of being pain on defecation. Bleeding sometimes accompanies the pain, but the lemerrhages are usually small. The treatment is to be directed toward the underlying cause. In most of the cases this suffices to cure the condition. Operation is rarely required in young children, although neglect may make this procedure necessary.

INCONTINENCE OF FECES

Inability to control the fecal evacuations is seen in certain cases of paraplegia due to myelitis, after injury of the lumbar pertion of the spinal cond, and in spina bifids. It may occur with the neual or with the seculit variety, associated with incentimence of urine, when there is no paralysis of the extremities. It is also seen in acute disease, as in the come of meningitis, and occasionally in the typhoid condition and in extreme adynamia, from any cause. It is quite common in severe attacks of chores. It may sometimes be seen after operations for atresia of the anna or rectum. In all these conditions incontinence of fecce is a symptom giving rise to much annoyance and needing careful attention. Uncleanliness with reference to excreta, seen in idiocy, can hardly be classed as incontinence.

Besides these familiar forms, the condition is sometimes seen from

causes somewhat resembling those of incontinence of urine. The tene of the sphincter becomes so feeble that it does not resist even the slightest impulse to evacuate the rectum. The discharge may take place with but little warning, and may occur either by day or night. In some cases a local cause exists, such as stretching of the sphineter by an old rectal prolarse. It has followed everdistention of the rectum from prolanged chronic constitution. Ostheimer reports a case in which a resical calculus was present. It is sometimes seen after severe scute illness, as a result of a loss of general muscular tone. In certain children it has been known to persist from infancy until the age of ten or twelve years. It may come on us a somewhat acute condition in highly nervous patients with poor general nutrition. The causes are chiefly of local and nervous origin. The treatment is rather unsatisfactory, except in recent cases and in these due to local causes which can be removed. If constipation exists the rectum should be emptied daily, preferably by an enema-The remedies which have proven most successful are strychnia, ergot, and belladonns, lest they must be given in full doses, sometimes advantagrously by suppository as well as by morth. The general health should receive careful attention.

CHAPTER XI

DISEASES OF THE LIVER

Asine from the different forms of degeneration which are seen in the rarious infectious diseases, the liver is not often the seat of serious discase in infancy and carly childhood. In later childhood nearly all the forms seen in adult life are occasionally met with, although even then they are quite rare.

Size and Position.—The weight of the liver in the newly-born child, from one hundred and seven observations of Birch-Hirschfeld, is 4.5 comes (127 grams), or about 4.2 per cent of the body weight. The accompanying table gives the results of one hundred and seventy-four ob-

	Ace	Per sent of			
Aqs.	Own	Grane	heely weight,		
3 months h 12 = 12 2 years	6.1 7.5 11.0 14.0 36.0	180 212 311 397 453	3.1 3.0 3.40 3.37 3.26		

servations upon the liver in infancy in the autopsy room of the New York Infant Asylum.

In adults, according to Frerichs, the weight of the liver is about 2.5 per cent of the weight of the body.

The upper border of the liver is best made out by percussion. In the child, the upper limit of the liver dulness in the mammary line is found in the fifth intercostal space; in the axillary line, in the seventh space; posteriorly, in the ninth space. The lower border is best determined by palpation. This, as a rule, in the mammary line is found about one-half an inch below the free bowler of the ribs. According to Steffen, the left lobe is relatively larger in the child than in the adult. The liver may be displaced downward by contraction of the chest, as in tickets, or by an accumulation of fluid in the plearal cavity. It is frequently found lower than normal in conditions of great emaciation, owing to relaxation of the abdominal walls and its ligamentous supports. Upward displacement is much less frequent, and depends usually upon ascites or abdominal tumors.

Malformations and Malpositions.—Congenital conformations relate shiefly to the bile ducts. These have been considered in the chapter devoted to Leterus in the Newly Born.

The liver may be found upon the left side in cases of general transposition of the viscora. In displangmatic hernix it has been found in the thurscie cavity.

CATABRHAL JAUNDICE

This is due to a catarrhal inflammation of the common bile duel with which there is usually associated a similar inflammation of the duodenum and sometimes of the stemach also. The term partec-duodenitis is sometimes used symmetrously with catarrhal jaundice. The jaundice in these cases is due to obstruction which is caused by swelling of the nuccous membrane of the bile duct. Catarrhal jaundice is rare in inflancy. In children from three to six years old it is not uncommon, and curiously occurs much more frequently in the full months. This suggests an infectious origin. For the most part its causes are observe.

It occasionally complicates malarial fever and may occur with any of the infectious diseases. Relat has described a form which occurred epidemically.

The symptoms of the disease are quite uniform: When primary, the enset is like an ordinary attack of indigestion, with running, pain, slight fever, and a moderate amount of prostration. The comiting in some of the cases is repeated for several days. The pain may be quite

severe, and localized in the region of the duodeums. It may be assaciated with tenderness in this region. The borrels are mustly constipated. After three or four days, icterus, which is the only diagnostic symptom, appears. It is first seen in the emjunctivas, afterward in the skin, varying in degree according to the severity of the attack, but in most cases not being very intense. It is accompanied by the regular symptoms of obstructive jaundice. The stools are gray, sometimes white; there is a marked amount of intestinal flatulence. The urme is very dark, of a willowish-green or bronze hue, and stains the clothing. There is complete apprexia; the tongue is thickly couted with a white fur. Headache, duiness, and languer are present, and the patient feels wretchedly. The slow pulse and the itching skin are uncommon symmtons in children. The liver is usually found slightly enlarged, and sometimes tender on pressure. The duration of the disease is about two weeks. the general symptoms disappearing before the icterus. Recurrences and prolonged attacks are occasionally seen. The diagnosis rarely presents any difficulty, and the prognosis is invariably good.

The late and starches of the food should be reduced to a low point or be entirely prohibited. Patients usually do much better upon a diet of rare ment, fruit, and skimmed milk, or buttermilk. If there is very much vomiting, food should be temporarily withheld and later skimmed milk should be given largely diluted with limewater. The amount of food given should be small, but water should be allowed freely, particularly the alkaline mineral waters. The bowds should be kept open, if necessary by means of catharties. In most of the cases no other treatment is necessary. When the pain is severe it may be relieved by counter-irritation by mustard, turpentine, or even cantharides. The restricted diet should in all cases be continued for at least a week after the painsice has disappeared.

NEW GROWTHS

New growths of the liver are rare in children and are usually secordary to deposits elsewhere, most frequently in the hidney. They are generally surcommittees. Primary surcome of the liver has, however, been observed, and at so early an age as to make it practically certain that the condition was a congenital one. In most of the cases there is simply a slowly increasing abdominal tumor and progressive authenia.

ACCUE YELLOW ATROPHY

This form of hepatic disease is rare in children. Greece has reported a well-marked case in an infant of twenty months, and has collected seventeen other cases under ten years of age; the youngest was in an infant three months old. The symptoms and course of the disease are essentially the same as in adults. A condition closely allied to this is occasionally seen as a result of the administration of chloroform.

CONGESTION OF THE LIVER

Congestion of the liver occurs from the same causes in children as in adults. Acute congestion is not often seen. Chronic congestion is more common, and is usually secondary to general venous obstruction dependent upon congenital or acquired heart disease, atelectasis, or other pulmonary conditions, particularly chronic pleurisy, chronic interstitial pneumonia and emphysema. Chronic congestion of the liver causes no characteristic symptoms except a moderate calargement of the organ with some pain and tenderness. The treatment is that of the primary disease.

ABSCESS OF THE LIVER-SUPPURATIVE REPATITIS

In 1890 Minser found but thirty-four recorded cases of abscess of the liver in children under thirteen years. Since that time a few additional cases have been reported. In the above collection, there have not been included cases of supparative hepatitic occurring in the newly born.

As in adults, abscess of the liver may result from transmitism, or it may be secondary to supportain pylephlebitis, which depends upon a focus of infection in the umbilical vein, or in some part of the abdomen from which the branches of the portal usin arise. Pyhephlebitis may follow appendicitis, it may follow typhoid fever directly, or be due to suppuration of the mesenteric glands or peritonitis following typhoid. In seven of the cases collected by Musser the disease was due to migration of roundworms from the intestine into the bepatic ducts. Menger (Texas) has reported one case following dysentery, the only one, we think, on record in this country. Very rarely great numbers of minute abscesses are found as a result of suppurative thrombois of the jugular tolls following module our disease. In quite a number of cases no adequate cause can be formal.

In the cases occurring in pyemia and in those associated with pylephielitis there are usually several abscesses; in traumatic cases generally but one. If untreated, the majority of cases prove fatal either from exhunction or from rupture into the plears or peritoneum. In Asch's case spontaneous cure took place by rupture into the intestine.

Symptoms - threatenally absress of the liver is latent, but in most of the cases the symptoms are marked and sufficiently characteristic to make the diagrams a matter of no great difficulty. The most constant general symptoms are chills, which may be single, but are usually repeated; force, which is commonly of the bectic variety and followed by awating: prostration, vomiting, durries, and exchesis. Janualies is persent in less than half the pases, and is rarely intense. The liver is almost invariable with worsty enlarged to be easily made out by palpution or by percussion; the enlargement is most cases is chiefly deviaward. Pass is quite constant and frequently intense, but not always in the region of the lives. It may be in the epigustrium, at the umbilious, in the lover part of the abdomes, and occasionally in the right shoulder, Tembraces over the liver is usually present. A positive diagnosis of hepatic aboves is to be made only by aspiration and the withdrawal of a fluid linving the characteristics of "liver pus." Pulmonary symptoms rounlly exist with an abscess occupying the convexity of the right lobe. There may be cough and dyspnea from pressure, or plearier from extension of the inflammation through the disphragm, or from rupture into the pleural cavity. The usual duration of abscess of the fiver after the beginning of the symptoms as from one to two months. The prognosis will depend upon the cause of the disease. The primic cases are usually fatal. In Musser's collection, the proportion of recoveries was about thirty per cent. At the present time, with improved methods of treatment and earlier diagnosis, the outlook is somewhat better than this,

Treatment.—This is purely surgical, unless the abscess is due to an amebic colitis. In that case emetin hydrochlorid should also be given hypotermically as advised under amebic colitis. Cases have been reported where, after undoubted evidences of abscess have been present, recovery has ensured with the use of emetin about. Without operation, however, the chances of recovery are slight. A small number of cases have been cured by asperation, but in the vast majority of abscesses use to any cause only incision and drainage are to be depended upon, and, if the abscess is accessible, should be resorted to as seen in the diagnosis is established.

CERREIOSIS

Cirrhosis of the liver is exceedingly care in early life, although quite a number of cases are now on record between the ages of seven and four-tion years. Sixty-five have been collected by Howard and fifty-three by Laure and Honorat. Nearly all the cases in these collections were between mine and different years obt. Cirrhosis in infancy is usually of Obligation origin. Two thinds of those in Howard's collection were useles.

The etiology in most of the cases is obscure; in over half of those reported no cause could be discovered. Fifteen per cent of Howard's cases were traced to alcoholism, eleven per cent to syphilis, and eleven per cent to subsrculosis. Laurè and Honerat believe that the eruptice fevers sometimes play an important part as an etiological factor, and that at other times the cause is possibly malaria.

The anatomical features of cirrhosis in early life are essentially the same as in adults. The liver is sometimes enlarged, but usually it is smaller than normal. The connective tissue may be distributed around the locales, along the hile ducts, in irregular patches, or in strictions through the organ. Associated with this there is atrophy and fatty degeneration of the liver cells. In some of the cases reported there has been also a similar increase in the connective tissue of the spleen and kidneys.

Symptoms.—These are very much the same as in solult life. In the beginning there are the indefinite disturbances referable to the digestive organs, and the liver may be slightly enlarged; later there is ascites, enlargement of the sphere, and dilatation of the abdominal veins. Ascites is a pretty constant symptom, and a generally marked. Slight interns is often present, but a marked amount is rare. There may be henouthages from the stomach, from the nose, or from other organs; in a few mass there is slight fever. The late symptoms are, a small liver, marked ascites with the consequent embarrasment of respiration, carbonia, and sometimes general dropsy. Diarrhes is a much more constant symptom than in adults. Death usually takes place from exhaustion. The course of cirrhoses in children is commonly more rapid than in adults, and the progress is simility downward.

Treatment.—Medicinal treatment is of avail only with patients who are syphilitie. These should be put upon antazyphilitic remedies in full doses. The treatment in other respects is symptomatic and pullistive. The medics may require paraceutesis as in adults.

AMYLOID DEGENERATION (Wary as Lordaccom Liver)

From the experiments of Krawkow, Davidsolm, and others there seems now little doubt that amyloid dependration can be produced by the prolonged action of the staphylococcus acreus, and probably by other organisms. Amyloid degeneration of the liver is associated with similar changes in the spleen and kidneys, and sometimes in the valle of the small intestine, and is usually seen in children after long-continued suppuration in chronic bone or joint disease, compress, informalosis, or apphilis.

The liver is generally very much colorged; in extreme cases a weight

of six or seven pounds may be touched. It is of a glistening, waxy appearance, very firm and hard. With a solution of todin, a maleganybrown reaction is obtained. The amyloid substance is deposited between the capillaries and the hepatic cells, leading to occlusion of the ressels and attroubt of the cells from pressure.

Amyloid liver per as produces few symptoms. Assites is rarely present except in cases in which the liver is very large, and jaundies does not occur. In addition to the symptoms of the original disease in the cause of which the amyloid degeneration occurs, there is the peculiar waxy cachexia which is seen in no other condition, but resembles semi-subst that belonging to malignant disease. The face has the appearance of alchaster, and the skin has a singular translucency. The liver may be so large as to form a termer, semetimes nearly filling the abdominal cavity. Not infrequently it extends to the ambilieus, and even to the crest of the ilium. The surface is smooth and band, and the edges usually rounded. There is no localized pain or tenderness. The spleen is invariably enlarged. As a result of the associated amyloid degeneration of the kidney, there may be anasarca and albuminaria. Dropy may occur from pressure of the large liver upon the verm cava, apart from the condition of the kidney.

Amyloid changes usually take place slowly, the whole course of the disease being marked by years, the patient dying from slow asthenia, from nephritis, or from some acute intercurrent disease. As a rule races go on steadily from had to worse; but sometimes, after the discuss has reached a certain point, the condition remains stationary for a long time.

The programs is always bad, although in a few cases improvement, and even cure, are stated to have occurred after the excision of the discased joints upon which the amylaid degeneration depended. When due to syphilis, the usual antisyphilitic remedies should be given.

FATTY LIVER

Patty infiltration of the liver is generally a secondary condition in early life, and causes no symptoms by which it can be positively recognized. Considerable discussion has of late arisen regarding its frequency in infants. From our records at the Babies' Hospital, Wellstein has tabulated 345 connecutive autoposes in which the condition of the liver was carefully noted. The liver was fatty in 201, or 38 per cent. Of these autoposes, 55 were cases of interculous, in 41 of which, or 68 per cent, the liver was fatty.

The general nutrition of the 345 infants was as follows:

Wasted.	188:	Ever	fatty.	104,	ot	55	per	count-	enty	Intry	in 17	
Fairly nourished.	500	14.	-	52,	OAA,	65	940	MA.	1	- 24	" 2	
Well nourshed	272			40.	111	200	-	11	-	- 11	11.20	

These figures coincide very closely with the observations of Freeman at the New York Foundling Hospital, and indicate that fatty liver is not, as has been so often asserted, much more frequent in wasted infants than in others. The cause of this change in the liver is as yet but little understood.

The liver is moderately enlarged, smooth, with rounded edges, of a yellowish-red or a lemon-yellow color, and can be indented with the finger. A warm knife becomes coated with oil after cutting. Microscopically there is seen an accumulation of fat in the liver cells, usually irregularly distributed, but chiefly in the periphery of the lobule. Jaundice, ascites, and the other peculiar symptoms of hepatic disease are absent. The liver is moderately increased in size. Its functions are not interfered with in such a way as to be recognized by the symptoms. The treatment is that of the original disease.

HYDATIDS

Echinococcus disease of the liver, while rare among adults in this country, is almost unknown in children. We have been able to find but two recorded cases in America. From twenty-two European cases collected by Ponton, it appears that unifornlar cysts are especially frequent in young subjects. If the upper surface is affected, pulmonary symptoms, cough and despotes, are usually present; if the under surface of the organ, there is pressure upon the portal vein, the vena cava, bile ducts, stemach, and intestines. This pressure may cause icterus, dilatation of the superficial abdominal veins, and semetimes ascites. The local signs are enlargement of the liver with a tumor, which is easily recognized in children because of the thin abdominal walls. The hydated fremitus is usually obtained. By aspiration a clear fluid is withdrawn, showing under the microscope the presence of the hooklets, which establistes the diagnosis. Occasionally cure may take place by spontaneous rupture or suppuration of the cyst, but in most cases, when left to itself, the disease proves fatal. The treatment is surgical, and consists in aspiration or in incision, and the evacuation of the cyst.

BILLARY CALCULI

Up to the age of puberty calcult are extremely rare. Of twenty cases collected by Still, eleven occurred in newly-born infants or else gave

symptoms during the first month of life. The prominent symptom was intense and persistent journiller. Nearly all died within the first month, the autopsy usually showing multiple calculi in the common duct.

The cases in older children do not differ from those in adults.

CHAPTER XII

DISEASES OF THE PERITONEUM

INFLAMMATION of the peritonents is seen at all ages, even in the first works of life; but is less frequent in children than in adults since most of the causes which are operative in later life either do not exist at all in childhood or are infrequent.

We shall consider separately neute, chronic, and inherculous peritonitis.

ACUTE PERITONITIS

Acute peritonitis may occur at any period of infancy or childhood. It may even exist in intra-exterine life. In the newly born, peritonitis is not infrequent. After this time it is exceedingly rare during infancy, only four cases, including all varieties, being met with in 726 consecutive autopsies in the New York Infant Avylum. After the fifth year the disease is relatively much more common. Of the 187 cases above to ferred to, 25 per cent securined in the nearly born, 21 per cent between one and five years, and 54 per cent between the fifth and the sixteenth years.

Etiology.—In the newly been, peritonitie is seen as one of the frequent besions of newte pyogenic infection. It is usually due to direct infection through the ambilical vessels. In infancy and chiblicol, peritonitie occurs both as a primary and secondary inflammation. The primary form is rare. It may be due to transmatism, such as falls or blows, or to surgical operations upon the abdoman; it has occurred after an injection for the cure of a congenital hydrocole. Very rarely the inflammation scene to have been excited by exposure, and it may follow severe burns. Cases of arute peritonitis are occasionally seen which are apparently primary. We have met with four in young children, two Isong due to the pre-unococcus and two to the streptococcus.

The secondary form is more common. The most frequent of all causes is appendicates, which should always be suspected in acute perito-

mitis accurring without definite cause. Extension of inflammation from the viscera to the pentaneum is very much less frequent in children than in adults. It is very earsly seen as a complication of dwentery. It is also rare in typhoid fever. It is occasionally due to abscess of the liver, alcer of the stomach, acute intestinal obstruction from internal strangulation, intrasposeption, volvalus, and congenital atresia. It may extend from inflammation of the plears. This may be in the form of an empyoma which burrows through the disphragm, or, without burrowing, the infection may take place through the lymph channels; or it may be secondary to a general pneumococcus septicemia. Peritonitis is infrequently due to infection through the female genital tract, especially in generature rules regimities in older girls. Extension of inflammotion from the male genital organs is very rare. In one case at the New York Infant Asylon, fatal peritonitie in an infant started from a suppurative inflammation of the tunion vaginalis of unknown origin, the infection extending into the peritoneum through the ingainal canal. Any alseess in the neighborhood may rupture into the periteneum and excite peritonitis. Those most frequent in children are connected with Pott's disease, peripephritis, and cellulitis of the abdominal wall, It is occasionally seen in premus from any cause, and quite frequently occurs as one of the complications of acytic sore throat.

Of the scate infectious diseases, peritoritis is most frequently seen with presuments, and very rarely with scarlet fever. It is also seen as one of the complications of soptic sore throat. When secondary to pneumonia, there is usually intense pleurosy and sometimes also peritarditis and meningitis; in other words a general pneumococcus infection is present.

The bacteria most frequently associated with acute peritoritis in children are: the streptococcus, especially in the newly born; the pneutaccoccus in cases complicating pneumonia or empyona; and the streptococcus associated with the b. coli communis in those following intestinal perforation.

Letions.—In the fibrinous form there are changes similar to those occurring in inflammation of the pleura and the other serous membranes. The peritoneum is injected and fibrin is thrown out in considerable quantity, usually accompanied by a small amount of erram. The process is usually a localized one. The peritoneum liming the addominal wall, as well as that covering the adjacent coils of intestine and the solid viscera, is covered by patches of yellowish-gray fibrin, causing adhesions between the various viscera and often matting the intestines together. In recent cases these adhesions are soft, and easily broken down; in old cases they are quite firm, and they may result in the formation of connective-those hands which are the source of subsequent trouble. In

other cases the serior is more abundant, usually clear, but it may be turbed so even bloody

In the purefeut form the products are serum, form, and pus. When peritonitis results from perforation it is, as a rule, purulent from the nutset, and the pus is fool and stinking. The amount of pus is proportionally larger than in adult cases. When the discuss process fatal in a few days there is found an extensive exudation of librin, with the formation of small pockets containing pus among the coils of intestine. Occasionally there may be larger collections of pus in the peritoneal cavity. In cases which have lasted a long time-generally those of be alized inflammation—the process results in the formation of a peritoneal abovess. This consists in a collection of pus in some part of the peritoneal eavity, the situation depending upon the cause, but it is usually in one ilino fossa or in the privis. The abscess is shut off from the rest of the peritoreal cavity by a thick wall of fhrin. If left alone, such abscesses may open into the restum, vaging, blabler, pelvis of the kidney, or externally-usually at the ambilious. After the discharge of pus the carrier may contract and fill up by granulation, and the patient recover.

Inflammations of the other serous membranes, especially the plears, are often associated with perstenitis.

Symptoms. The symptoms of scute peritonitis in older children, as in adults, are usually well marked and sufficiently characteristic to enable one to recognize the disease easily; but not so in the case of infants. In them the symptoms are often obscure, and the disease may be found at autopsy when not suspected during life. The onset is nearly always abrupt, with fever and vomiting. As a rule, the temperature is highfrom 160° to 105° F. Vemiting may occur only at the easet, but it often continues; the somited matters are usually green. Other children complain of pain, which may be localized or general, and in younger ones this is indicated by crying and fretfulness. The abdonsen very soon becomes swellen and tympanitic, this being one of the most constant features of the disease. The distention is generally uniform, but it may be irregular. There is tenderness on pressure, and usually marked rigidity of the abdominal walls. The pain causes the child to assume a fixed position and he cries if moved or disturbed. The posture is generally dorsal, with the thighs flexed. The bowels are in most cases constiputed, but diarrhea is by no means rare. The abdominal distention causes dysposes and theracic breathing. There may be retention of trine or frequent micturition.

The general symptoms, almost from the beginning, are those of a serious discuss. The pulse is small, rapid, and compressible. The prostration is great, from the very outset. The face is pinched, the month is drawn, and the features indicate pain. In severe cases there may be hiccough, cold extremities, clammy perspiration, and collapse. The mind is usually clear. In infants there may be convulsions. A polymorphomoclear leacocytosis is almost invariably present, but is wanting in some cases of the gravest type.

In the most severe forms of general peritonitis the course is short and intense, and the disease goes on rapidly from bad to worse until death occurs. In infants this is often on the third or fourth day. The very severe forms of general peritonitis in obler children run the same rapid course. In other cases the course is slower, lasting a week or ten slaps. If the patient lives longer than this the case is more hopeful, because the process is more apt to be localized. The development of peritoneal abscess is indicated by the continuance of the temperature, which may assume a hectir type, and be accompanied by chills and sweating. There are the local signs of an abdominal tumor.

Prognosis.—Acute general peritonitie, whatever its cause, is a very serious disease in childhood. Of eighty cases of all varieties under sixteen years of age, sixty-nine per cent were fatal. In the newly born and in infancy the disease is almost invariably fatal. In older children the outlook is not quite so hopeless, and depends upon the exesting range.

Treatment.—The medical treatment of acute general peritonitis in shifteen is extremely unsatisfactory, as the disease is almost always fatal unless it can be relieved surgically. Opium is indicated only for the relief of the single symptom, pain. It has, however, serious disadvantages in that it may mask important symptoms. Other medical treatment is symptomatic only and is to be employed in conjunction with surgical measures.

As a focal application cold is nearly to be preferred. It may be applied either by an ice-bag or by a Leiter's coil. If children rebel against the use of cold, heat may be substituted. Turpentine stupes may aid in relieving tympanites.

Feeding is always a difficult matter on account of the strong tendency to vamit; this is due to regargitation from the intestine into the stemach, which in some cases is almost continuous. In such conditions great benefit may be obtained from washing the stomach sheetly before feeding, repeating this several times each day. In this way vomiting may aften be controlled and the stomach made ready for food. The diet should be milk, broth, or buttermilk.

In every case of scute peritonitis an immediate exploratory operation should be done if the child's general condition will permit. Appendicatis in often found to be the cause when least expected; and even when the peritonitis is due to some other cause operation gives the only chance for recovery. Operation is also indicated in localized inflammations with the formation of peritoneal abscesses.

CHRONIC (NON-TUBERCULOUS) PERITONITIS

Peritonitis may occur in fetal life with the production of extensive adhesions, which may interfere with the development of the intestine and result in various melformations. These cases have been ascrated by Saltermann to applicits.

Chronic peritonitis may follow the neute form, in which there are left adhesions which slowly increase owing to the production of new connective times. Such cases are sometimes chronic from the le-

graning.

The peritoneal abscesses which follow the suppurative form may run a chronic course. Chronic localized peritonitis may occar in connection with disease of any of the organs covered by the peritoneum.

Chronic Peritonitis with Ascites.—In most cases this is chronic from the soutset and independent of the causes above mentioned. By far the most frequent form of inflammation is that due to tuberculosis, and by some writers the opinion is still held that chronic peritonitis with motes is always tuberculous. After the observations reported by Henselt, Viersellt, Fiedler, and others, there seems to be little room for doubting the existence of a chronic non-tuberculous form of peritonitis with secites, although it must be considered a rare disease.

Elistopy.—Nearly all the cases thus far reported large occurred in children over six years old. The causes are for the reost part obscure. Chronic peritonitis may be associated with disease of the intestines or the solid tiscera of the abdomen, especially with new growths of the kidney, liver, etc.

Lexicos.—The post-mortem observations thus far have been few. In the reported cases there has been found a large amount of greenish serum in the general peritoneal cavity, with a very moderate amount of fibrin and with adhesions, which are sometimes few and sometimes very namerous. Chronic pleurisy may be associated.

Symptonic.—The early symptoms are of a very indefinite character, but often nothing whatever is noticed until the swelling of the addomen begins. The colargement comes on rather gradually in the course of a few weeks. Pain is slight, or wanting altogether. There may be some addominal tenderness. The addomen is usually distended with fluid. The general symptoms are very few. In some cases there is a slight evening rise of temperature of one or two degrees. There may be general weakness, loss of appetite, and moderate anemia.

The usual course of the disease is for the fluid to remain for a time and then undergo slow absorption. In some instances there is no tendency to absorption of the fluid, the general health is gradually undermined, and the patients dio from exhaustion or from some inter-current disease. The diagnosis rests upon the presence of ascites, developing gradually without any signs or symptoms of disease in the heart, liver, or other organs. The points which distinguish it from tuberculous peritonitis are considered under that disease. The prognosis must be guarded on account of the difficulty in making a positive diagnosis from the tuberculous form.

Treatment.—The treatment is entirely symptomatic. The patient should be kept at rest, preferably confined to hed. When there is no tesslency to absorption, and especially when the patient's general health begins to suffer, the finid should be removed by paracontests. If it continues to accumulate after repeated tapping, laparotomy may be performed, for in some cases this has the same beneficial effect as in intervalous peritonitie.

TUBERCULOUS PERITONITIS

The periloneum is quite frequently the seat of tuberrulous inflammation in early life. It occurs especially between the ages of one and five years, but is infrequent during the line year. Of 100 cases observed by Still, the largest number were seen in the second year of life. In 235 autopoies upon tabervulous patients, most of them under three years old, of which we have records, the peritoneum was involved in 8,5 per cent; but in a majority of these the peritonitis was not the most important lesion nor the suuse of death. Tuberculous peritonitis is apparently much more frequent in Europe than in this country. Thus, Still states that this was the cause of death in 16.8 per cent of his tuberculous palacets under twelve years of age, and in 12 per cent of the deaths from inherentesis under two years. In 105 antopsies, for the most part upon older inherentesis children, Ashby found the peritoneum involved in \$6 per cent. In 883 collected autopsies upon tuberculous children of all ares, Bielert found the persteneum involved in 18.3 per cent. These figures do not represent the number of cases of taberculous peritoritis. us in many of them only a few military tubercles were present.

It is possible for peritonitis to occur as the primary lesion of tuberculosis, the bacilli entering by way of the intestine, causing no lesion of the mucous membrane; but in the great majority of cases it is secondary to tuberculosis of the intestine, the mesenteric glands, the plenra, or to that of more distant parts, such as the lungs, the broachial glands, etc. In a small number of cases there is a history of some local exciting cause, such as a fall or blow upon the abdomen. The bovine type of the tubercle busillus is more frequently found in tuberculous peritonitis than in any other form of tuberculosis, possibly excepting cervical adentits, which fact is strongly suggestive of milk as the source of infection.

Tuterenloss peritonitis is usually associated with other abdominal business—tuberculosis of the mescuteric glands, inhotinal alteration, etc. It is very rarely ucute, but usually occurs as a subscute or chronic disease.

The peritoneum may be involved as one of the lesions in acute or subscate general unitary taberculasis. The lesions consist in a deposit of miliary tabercles, which are generally rather sparsely scattered over the peritoneum. The evidences of inflammation are very slight, or they may be absent altogether. These cases do not come under observation as cases of peritonitis, as there are no abdominal symptoms.

The principal anatomical and clinical varieties of tuberculous peritomitis are the ascitic and the fibrous forms.

The Ascitic Form.—This is much loss frequent than the fibrons form. The peritoneum is thackly sown with military tuberdes, both sharests and in conglemerate masses. They are found in the omentum and the mesentery, upon the surface of the intestines and the sulid siscera. The peritoneum shares in varying degrees the changes of acute or subscute inflammation, with the production of a moderate amount of fibrin and a large amount of serum. In the most acute cases the fluid is in the general personnal cavity. In those of longer duration it may be sacculated. The fluid is usually abundant, but not excessive. It is most commonly a straw-colored serum, but it may be seropuralent, or seen bloody. There are commonly other become of tuberculosis in the body, but they are usually less marked than those of the peritoneum.

Clinically, ascitic cases asually present the symptoms of a low grade of peritoscal inflammation. The onset is gradual, with indefinite general symptoms. There is usually some fover—100° to 101.5° K. There is general weakness, prostration, and some loss of flesh, but not rapid emociation. Vomiting is not prominent, and pain and tenderness are often absent. There may be nothing distinctive until distention of the abdomen is seen. This at first is due to intestinal gas, but later to fluid, which may accumulate in sufficient quantity to fill the general peritoscal cavity. The bowds may be contipated or there may be distribut. In other cases there may be only a slowly developing ascites without any inflammatory signs, and the abdominal enlargement is practically the only symptom.

The ascitic form of tuberculous peritonitis may result fatally, death occurring from general tuberculous or by slow exhaustion from the local disease; the duration under these conditions is usually from two to six months. At other times the fluid may gradually undergo absorption and recovery take place, or after absorption the fibrous form of inflammation may develop.

The Fibrous Form.—This is generally slower in its development and more chronic in its course than the ascitic form. There is a tuberculous inflatemation, the products of which have undergone transformation to a greater or less extent into fibrous tissue. The most important feature of these cases is the production of extensive arganized adhesions between the solid viscora and the intestines, between the intestinal coils, and between the intestines and the abdominal walls. The intestines may be compressed against the spine by bands.

These adhesions and their mechanical consequences are sometimes almost the only lesions present. In other cases there may be an accumulation of fluid, which may be sacculated or in the general peritoneal cavity. This may be serious, seroparulent, or purulent. The omentum may be greatly thickened. There are often present in the fibrous exudate rovering the intestines, in the omentum, and in the mesentery, tuberculous deposits consisting of caseous nodules or larger caseous masses, which are frequently softened at the center. Tuberculous deposits are found upon the peritoneal surface of the intestine, and infiltrate the intestinal walls, often leading to perforation, and sometimes to fistulous communications between adherent intestinal coils. There may also be tuberculous infiltration of the abdominal walls, accompanied by cellulitis, resulting in abscesses, which may open externally, usually in the neighborhood of the ambdicus.

Clinically, these cases are distinguished by their slow, irregular course. They are the most chrenic of all the forms. The enset is generally insidious, and fever is commonly absent. There is rarely vomiting. The lowels may be constipated or loose. For a long time the general health may remain good. The only characteristic symptom is the enlargement of the abdomen. In the early part of the disease this is chiefly from the tympanitos, but later there may be some accumulation of fluid. It is rare that the inflammation remains entirely fibranous. Ascites usually develops very slowly, but may be abundant. The adhesions of the intestines may give rise to irregularities in the outline of the abdomen. Ascites may be present for a time and then disappear spontaneously, and the general health may so improve that the patient is considered quite well. There may even be a permanent cure. In other cases, after symptoms have been absent for some time, relapses occur, and more fluid is poured out. In addition to these symptoms,

ethers are present depending upon the mechanical effects of presence from the confracting adhesions. There may be more or less constriction of the intestine, pressure upon the vena cava, the renal or portal veins, the thoracce duct or its branches, or upon the stomach. These conditions may give rise to dyspeptic symptoms, emaciation, edems of the lower extremities, and albuminuris. In some cases tuberendous personitis is entirely latent, and it is discovered at autopsy when there have been either no abdominal symptoms during life, or only velicky pains of an indefinite character. The course of this form of peritoritie is show and irregular; it generally lasts for from six to trobe mouths, although with intermissions and exacerbations it may extend over several sums.

If softening and breaking down of inflammatory products take place. well-marked constitutional symptoms are usually present. These are partly from the peritonitis and partly from general tuberculosis. Fever is regularly present, the temperature usually ranging from 90° to 107° For through it is occasionally much higher. There is progressing emeciation, anemia, prostration, and eventing. Diarehou is frequent and the intestinal discharges may at times be bloody. The abdomen is large, but not so much distended as in some of the other forms; the superficial years are frequently prominent. Assites often our net be made out by percussion, even though third is present. Areas of Juliess and tympanitic resonance are irregularly distributed. Nodular masses of various sizes and irregular shapes may be felt anywhere in the glidomen, but they are more frequently in the region of the umbilious and in the right iliae from than elsewhere. The apigustric region may be occupied by a smooth, hard tumor-the thickened omentum-which may resemble the liver. There may be the signs of phlogmorous inflanmation of the abdominal wall in the neighborhood of the unbilless. and even an abovess, which, after opening, may leave a fistulous communication with the peritoneum. There are smally some signs of discase in the lungs, and the pulmonary symplems may mask those of the abdence. The course of the discuss, when seftening and breaking drwn have taken place, is steadily progressive, the usual duration being from three to six months. Death results from the pulmonary disease, from tuberculous maningitie, from exhaustion, and occasionally it is due to accidents associated with perforation.

Diagnosis.—The essential symptoms of tuberculous peritonitis are an enlarged abdonen, often with evidence of fluid, wasting, colicky paras, irregularity of the bowels, nodular masses in the abdonen, and usually slight but continuous fever. In young children chronic ascites with fever notally means tuberculous peritonitis. Ponting of the navel, with inducation and redness about it, is suggestive, and any chronic absent

in the neighborhood of the umbilious is suspicious. If the abdominal affusion is sacculated instead of diffuse, the probabilities of peritonitis are much increased. If there are added physical signs pointing to disease of the lungs or the evidence of tuberculosis elsewhere, and a positive cutaneous tuberculin reaction, the diagnosis is almost certain. Circhesis of the liver is practically unknown in infancy and early childhood. When ascites is absent, tuberculosis of the peritoneum may be suspected if there are irregular nodules or masses in various parts of the abdomen, with tenderness, emaciation, colicky pains, and, in the later stages, fever. But fever may be absent for a long time, even though local symptoms are marked. The epigastric tumor due to emental thickening may be mistaken for the liver; but it generally extends quite across the abdomen, and the upper as well as lower feeder can often be felt. Fecal masses may resemble tuberculous deposits, but are removed by cathartics and enemats.

Abdominal paracentesis to establish the presence of fluid or to allow of its examination is not justifiable. The danger of injury to the intestines even when a considerable accumulation of fluid is present is too great.

Progressis.—Tuberculous peritonitis is always a serious disease, but by no means a hopeless one. The younger the child as a rule the more rapid the progress of the disease and the worse the outlook. The progressis is especially had during the first three years of life; at this period most of the cases terminate fatally. Many cases occurring in older children recover spentaneously and entirely. The most hopeful ones are those with meites. But even in the forces form some apparently complete recoveries take place, the adhesions disappearing by absorption to a degree truly remarkable. The most unfavorable cases are those in which there is strong evidence of the breaking down of inherenious deposits, with continuous fever and wasting.

Treatment.—The general treatment of tuberculous peritonitis is similar to that of tuberculosis in other parts of the tody. The assentials are, rest, which should be invariably in the recumbent position, a climate mild enough to permit the patient to remain out of diors the greater part of the time, and very careful attention to feeding, with the purpose of improving the general nutrition. Heliotherapy, or the direct exposure of the abdomen to the sun's rays, has been much variated as a remedy and merits a trial as it can be employed in conjunction with the measures just mentioned. Beginning with a few minutes' exposure the time may be gradually lengthened to two or three heurs. Under general treatment a very considerable number of patients recover, especially those who are over three years old. Such a fermination is more likely if the diagnosis has been made early and if the

disease is limited to the peritoneum. Drugs play but a small part in the treatment of these cases. The value of tuberculus in tuberculous peritonitis has not yet been established.

In cases not progressing favorably under medical treatment, the question of operation should be considered. This was for a number of years a very frequent procedure and was employed in almost all cases. The results were not, however, such as to make it advisable as a routine measure. Hygienic treatment alone accomplishes in general as much if not more. In certain circumstances, operation is advisable. The most favorable cases are show of the ascitic variety. It may be useful also with localized or general suppuration and for the relief of intestinal obstruction occurring in the course of the disease. Operation affords temporary relief in some cases when the distention is very great. In the fibrous form not much is to be expected from it. Operation may be done for the relief of recurring colicky pains due presumably to constriction by bands. The existence of other foci of tuberculosis does not contraindicate operation except when those are chiefly intestinal, or when there is advanced general unberculosis. In deciding the question of operation, ats unfavorable results should also be horse in mind. A not uncommon consequence is injury to the intestine from the breaking up of adhesions, which may result in fecal fistular For the surgical aspect of the treatment the reader should consult works upon surgery.

ASCITES

Ascides consists in an accumulation of fluid, usually clear serum, in the general peritoneal cavity. It is a symptom of the various forms of peritonitis, especially the chronic varieties described in the preceding pages. It may be due also to portal obstruction from circhests of the liver, or presente upon the portal vein by peritoneal adhesions or large lymphatic glands. It is occasionally seen in all forms of abdominal tumors. Ascides may occur in general dropsy from cardiac disease, or from any condition causing pressure upon the vena cava. It is also seen in the general dropsy of renal disease. A medicate amount of ascides is often met with in extreme anemia or lenkemia.

Small accumulations of fluid in the peritoneal cavity are difficult of detection. Large amounts are generally easily made out. There is a uniform smooth distention of the abdomen and dilatation of the superficial veins, especially about the umbilions. On palpation, the wave of fluctuation can be obtained by placing one hand against the abdomen upon one side and giving the opposite side a sharp tap. A similar wave may be felt when there is tympanitic distention. The two are, however, distinguished by having an assistant make pressure with the edge of the hand along the linea alba while the test is being made; this obstructs the wave transmitted through the abdorsinal wall, but does not affect that through the fluid. On percussion in the sitting posture, there is dulness below and resenance above. When the putient is recumbent, there is resonance in the median line and dulness or flatness in the lateral portion of the abdomen.

The progness and treatment of ascites will depend upon its cause.

Chylous Ascites. This term is applied to certain cases in which the abdominal fluid contains fat. The color may be milky-white or light brown, and the fluid, after standing, may have at its surface a thick, creamy layer. The amount of fat present has been as high as five per cent. This condition is rare in childhood. The exact pathology is as yet not well understood. In the cases which have thus far come to autopsy there has usually been found chronic peritonitis, sometimes simple, sometimes tuberculous. The lymph wessels in some of the cases have been empty, and often no obstruction of the Irmsh circulation could be discovered. The fat is believed by some to be derived from fatty degeneration of the products of chronic inflammation, but this ssens hardly sufficient to explain the large amount of fat semetimes found. In some of the cases it has been due to a wound of the thoracic duct. The amount of fluid is frequently very large. The prognesis is usually had, although Pounds has reported a case in a girl of ten years, where recovery followed laparotenyr. Tuberculous peritonitis was present.

SUBPERENIC ABSCESS.

In the group of cases of localized peritonitis or peritoneal aboves, must be included subphrence aboves. This is a rare condition in child-haed, and consists in an accumulation of pus just beneath the disphragm and above the liver. Its cause may be either in the thorax or in the abdomen. It may complicate scate presumenta, usually of the right lower lobe, by a direct extension of infection through the lymph channels. Sometimes it has been associated with phthosical cavities. In the abdomen it results from the extension of some focus of supportation, such as an abscess around the appendix or abscess of the liver. The accumulation of pus is sometimes very great, so that the disphragm is crowded high into the thorax.

The symptoms and physical signs closely resemble those of empyoma, and most of the cases have been operated upon with the belief that the surgeon was dealing with empyoma. Meltrer has reported a case in a child of two years which followed pneumonia of the right base. At the operation only a few drops of pus were found in the pleural cavity; but there was discovered a pinhole opening in the disphragm, from which the pus had escaped, and a large subphrence abscess. This was exacuated, and the patient recovered perfectly. Subphrence abscesses may contain air; they are then likely to be mistaken for pneumothorax. These abscesses require incision and drainage like other forms of peritoneal abscess.

SECTION IV

DISEASES OF THE RESPIRATORY SYSTEM

CHAPTER I

NASAL CAVITIES

ACUTE RHINOPHARYNGITIS

(Acute Nesel Catarri-Corgze)

Altrhouses the symptoms of acute pasal catarrh are chiefly useal, the principal seat of the pathological process is the rhinopharyux.

Eticlogy .- Certain children are predisposed to attacks of acute musal extarrh. This predisposition, as it sometimes extends to entire funilies, may be inherited; but more frequently it is acquired, and usually by the following mode of life: It is seen in children who get very little fresh air, because they are kept indoors unless the weather is perfect; who live in houses always overheated; whose sleeping rooms are kept carefully closed at night for fear they may take cold; who are for the same reason so overloaded with clothing that they can not engage in any active play without being thrown into a profuse perspiration. These conditions after a time result in a great sensitiveness of all the mucous membranes, but especially those of the nose and pharyax, which is much increased by residence in a damp, changeable climate. Young infants and those who are rachitic, are frequent sufferers from scuto much catarrà. Attacks are often brought on by insufficient covering for the head, by wetting the feet, by cold and exposure, especially to street dust. and the raw winds of winter and spring, accompanied by the dampness which occurs with melting most. In susceptible children the exciting cause is often a very trivial one. A draught of cold air for a few minutes may be sufficient to excite sneezing and a susal discharge. Atmospheric conditions are probably not the only cause of acute main estarth. Microloganisms certainly play an important part. The staphylococcus, streptococcus and pusumococcus are commonly found associated with this condition, much less frequently the influence bacillus,

Recent observations of Tunnicliff showed the presence of a new organism called the "bacillus rhinitis" in 98 per cent of the cases of acute rhinitis studied and in 66 per cent it was the only organism present. It is a Gram-negative answerbic harillus. Acute entarth may be speradic or spidemic; certain forms are contagious, being communicated by children using the same handkerchief, occupying the same ted or simply by close contact.

Acute most cutarrh may be a symptom of measles, massi diphtheria, or influence, and it may accompany stysipelas of the face.

Symptoms.—In the mild from the changes in the muccus membrane of the nose are not great, and are usually secondary to those of the rhinopharyux, being in a large measure due to the discharge. There is reduced a dight swelling. The mucu passages may be for the line quite occluded by the discharge, which is usually profuse, at first ecomicous, and later mucoparalent. The symptoms may be very transient, semetimes passing away in a few hours; in which case there is only a vasorator disturbance; or they may continue and develop into a true inflammation. The discharge may execute the nostrils and the upper hip. At the onset there is usually energing, and in infants often a slight fever.

In older children there is no rise of temperature except in the most severe cases. The obstruction to nasal respiration causes monthbreathing, and the dryness and discomfort which result from it produce disturbed sleep, smalling and difficulty in nursing, this being in severe cases almost impossible. The inflammation may extend to the lackrymal duct, involving the eyes in a mild conjunctivitis. The process eften extends to the larynx and bronchi, with hourseness and cough. Three may be closure of the Eustachian tubes, causing deafness and stalgis. The chief complication for which the physician should watch is ofitis.

The severe form in infants is often attended by marked constitutional symptoms; the temperature may be as high as 104° or 105° F, and sometimes fluctuates widely. The discharge soon becomes minoparallest and is very profuse, pouring from the anterior nares and filling the pharyan. The cultures in this form frequently show the preumoscocus. Severe symptoms often continue for a week or more, the shild being seriously ill. Complications are almost always present. In most cases there is cervical adentitis and otitis. If the child is a delicate one bronchepurationia is apt to develop. Betropharyugeal aboves is not infrequently seen.

Diagnosis.—It is important to distinguish between a simple arate cutarrh and one due to measles, influence, musal diphtheria, or hereditary syphilis. Measles and influence usually comes more fever and general constitutional disturbance than does simple cutarrh. Nasal diphtheru may be present when there is only a profuse discharge tinged with blood. When such a discharge persists for two or three weeks this is always to be suspected, even though the constitutional symptoms may be very alight. The only positive means of excluding diphtheria is by cultures. A persistent scute usual cutarrh in a young infant should always suggest syphilis, and the patient should be carefully watched for the development of other symptoms.

Treatment.—A young shild suffering from acute cosym should be kept indoors in a room with an even temperature of about 70° P., the bowels freely opened, and the amount of feed somewhat reduced. The only drug which seems to have much influence upon the secretion is

belladonna.

Useful local applications are liquid albelene, eleastearate of zinc, or alkaline sprays, such as Seiler's solution, to clear away the secretions. If the musal obstruction causes great interference with respiration or nursing, epincphrin diluted with a saline solution may be used with a medicine dropper.

The upper 2p and nostrils should be protected by vaseline or some simple ointment. Under no circumstances should irritating or astringent injections be given. In older children inhalations of spirits of

camphor may be used with some advantage.

The severe cases require more active treatment. For most of them nasal irrigation with a warm saline solution is to be advised. This should be done as in diphtheria. After cleansing the thinopharyax a few drops of a five-per-cent solution of argyrol may be dropped into the nostrile two or three times dealy.

Prophylaxis consists in solving the përplexing question, so often put to the physician, of how to present children from "taking cold." This is a matter of the utmost importance, and follows what has been previously said under the head of Etiology. No amount of cod-liver oil and from will remove this tendency to cutarrh as long as bad hygienic conditions continue. Sleeping rooms should be large and well ventilated, and a window should be kept open at night, except in very severe weather or during acute attacks. The temperature of the house during the day should be kept from 65° to 68° E, but not above this. Children should be accustomed to go out of doors unless the seather is especially had. So firmly recoted in the minds of the laity is the idea that acute catarrhs come from cold, that the habit of coddling delicate children is always likely to be carried to an extreme.

With every delicate and "catarrhal" child one should begin in the summer by having him live in the open six as much as possible, sleeping in a recen with free ventilation, with moderate covering, and continuing the same practice into the fall and early winter. If begun gradually in this way there is little difficulty in continuing throughout the winter.

The next point to be insisted on is cold sponging immediately upon rising in the morning, especially about the chest, throat, and spine. The use of clost protectors, rotten pads, and extremely thick clothing should be prohibited. Weeken underciothing should be worn upon the chest throughout the year, and upon the legs also in winter; the very lightest in summer, and only a medium weight in winter.

Frequently repeated attacks point to the presence of adenoid tegetations in the pharynx, and no measures are of much stail until these

are removed.

CHRONIC NASAL CATARRIL

This term is rather lossely used to designate a chronic usual discharge. Such a discharge is common both in infancy and childhood. It is a condition frequently neglected by physicians. Patients are too often subjected to routine constitutional treatment by cod-liver oil and preparations of lodes, with the idea that such cases are "scrafulous," while local treatment is either neglected altogether, or consists only of the use of the usual douche or springing with a saline solution. Permanept damage to the organs of hearing, smell, speech, and respiration may result from neglecting or ignoring chronic usual cataerh in childhood.

Chronic nasal catarrh is not to be regarded as a disease, but only as a symptom which may be due to any one of a variety of pathological conditions, each of which requires very different treatment, viz., adexed growths of the pharyax, foreign bodies in the nose, polypi, deviation of the septum or any other congenital deformity of the result passages, the various forms of chronic rhinitis, and syphilis, which causes a form of rhinitis peculiar to itself.

Adenced Growths of the Pharyax.—These are more fully discussed elsewhere. They are by far the most frequent cause of chronic most discharge in infants and young children, and should be first suspected. The nasal discharge accompanying adenaid growths is due to a chronic rhinopharyagitis. Treatment is without avail unless the growths are removed. After this is done the nasal discharge usually disappears quite premptly.

Foreign Bodies in the Nose,—This condition should be suspected whenever there is an abundant nuccoparalent discharge limited to one nestral. Foreign bodies in the nose are quite frequent in young children. Peas, beans, leads, or shoc buttons are most frequently lodged there. The efforts at removal on the part of the child, or the parents, generally result in pushing the body farther into the nose. It first sets up a mechanical irritation, accompanied by pain, swelling, sneering, and sometimes homorrhage. This is followed by a catarrhad inflammation which in the course of a few days becomes purulent and may last indefinitely. The discharge is generally quite abundant. The symptoms point to an obstruction of one nestril, and an examination with a probe readily detects the presence of the foreign body.

In recent cases the removal of the foreign body may sometimes be accomplished by compressing the empty nestril and having the chible blow his nose strongly. Often the sacering which the foreign body excites is sufficient to remove it. Before any attempt is made to sene the body with forceps, cocain should be used, not only for the purpose of preventing pain, but in order to contract the muosus membrane so is to allow better manipulation. In many cases general anesthesia is necessary. In most circumstances ordinary foreign bodies can with proper forceps be extracted without difficulty. No subsequent treatment is required, except the use of some mild antiseptic to keep the nose clean for a few days, as the inflammation quickly subsides after the removal of the cause.

Nasal Pelypi.—These are among the infrequent causes of chronic nasal discharge in childhood. They are especially rare before the seventh year, but both mucous and fibrous polypi are seen. The symptoms are those of a chronic nasal catarrh with partial or complete abstraction of one or both sides. Polypi increase in sice with the occurrence of every acute coryse, and are always especially troublesome in sharp weather. They may be accompanied by reflex symptoms, such as cough, accepting, and even by attacks of asthma. There may be headache, and sensetimes disturbances of smell, taste, and hearing. The symptoms are of much lenger duration than in the case of obstruction from a feerign body, the discharge is not so abundant, and is not puralent. The daugnosis is made only by local axamination.

Polype may be removed with the forerps, but this is lest accomplished by the use of the wire source. When they have been present for a long time the accompanying chronic rhinitis may require subsequent treatment.

Deviation of the mosal septum, and other congenital deformities which may cause narrowing of the mosal respiratory tract, are conditions which belong to the specialist.

CHRONIC RHINTIS

Simple Chronic Rhinitis.—Simple chronic rhinitis existing alone is of rare occurrence in young children. In the cases so classed the symptons are usually due to thinopharyngitis, which almost invariably depends upon adenoid growths. The growth may be a small one, so that the symptoms of obstruction are slight or absent. A frequent complication is chronic enlargement of the coryical lymph nodes.

The only constant symptom is an excessive mosal discharge which is ascally macross but which may be macopuralent. It is easily removed by blowing the ness if the child is old enough to be taught to do this Children too young to clear the ness in this way suffer from almost constant discomfort. The amount of discharge depends upon the severity of the case. It frequently causes irritation of the upper lip, which may be the sent of exarms or impetigo, especially in infants. The lip may be swollen and prominent. The conslition of the external parts is aggrevated by the constant disposition to pick the ness, which may be exercome by the application of a short anterior splint to each elbow.

Epistaxis sometimes occurs. The duration of the disease is indefinite; it may last for months or even for years, the symptoms in simusebeing insignificant, but returning every cold sensor. It may be minute in recovery, or, in children with flathly tissues and delicate constitution, it may be followed in later childhood by hypertrophoc chimitis.

Treatment.—Prophylaxis is important. The main purpose should be to prevent attacks of acute pasal cutarrh by the measures mentioned in the discussion of that disease. The general treatment should not be routine, but based upon the indications of each case. General traintreatment is required in most cases.

Local treatment consists first in cleanliness, and, accordly, in the use of astringents. In infants, if the discharge in abundant, an efficient method of getting rid of it is by musal syringing. This is attended by some risk of forcing materials into the middle ear; but if very carefully done, the danger seems to be less than that of allowing the discharge to remain. All relations are to be made with sterile water and used warm, either with a mosal double or syrings. No force should be employed. Either Doboil's or Seiler's solution may be employed, diluted with an equal amount of water. Becently there have been introduced several devices for removing abundant secretion by means of suction, which abraste the risks attendant upon the syringe and are even more efficient. Ordinarily, the new should be cleaned thoroughly twice a day, more frequently in very severe cases. Harm is often done by the overcealous use of local treatment in these conditions.

Syphilitic Rhinitia.—Rhinitis is seen both in early and late heredstary syphilis. Coryca, or smaller, is one of its surfiest and most constant symptoms. It usually begun between the third and sixth weeks of life, rarely after the third month. The pathological condition is a subscale cutarrial chinitis, sensitimes with the formation of superficial ulcors or mucous patches. The disease is usually attended by a professe usual discharge of seromucas or mucopus, occasionally tinged with blood. It may continue from a few weeks to two or three months. It usually requires only constitutional treatment and protection of the nestrils and lips by the use of the ointment of the yellow exid of mercury diluted with four parts of vascline. When the discharge is very abundant any one of the cleaning solutions proviously mentioned may be used as a spray.

The rhimitis of late hereditary syphilis is a very different pathologiral condition. There are here gummatous deposits which break down, and form afters of the marcon membrane and deeper tissues. There is also periostitis, with extension of the disease to the cartilages and bones of the musal fossur, particularly of the seption. There may be perforation of the triangular cartilage, necrosis of the vomer or nasal bones, perferation of the hard or soft palate, and at times extensive ulceration of the alse nasi and the face. Cicatrization may follow, causing stems is of the nostril. These lesions in the nose are generally accompanied by deep alcoration of the pharynt and soft palate. They usually occur in children who have presented the early symptoms of hereditary syphilis, but are occasionally seen when no such history can be obtained. Such was the case in a patient recently under observation in the Babies' Hospital, who had perforation of the must septum and of the floor of the nasal fossae, causing a free communication with the mouth. These are cases of true opers. The odor from the discharge is at times almost intolerable. When neglected these eases go on from bad to worse and may continue for years, producing unsightly deformities.

The constitutional treatment is that of hereditary syphilis in general and is discussed in the chapter upon that discuss.

Locally there may be used a spray of one of the cleansing solutions already mentioned, or black wash, or a solution of bichlorid of moreury, 1 to 10,000. Although improvement may take place quite promptly, the results of treatment in the late cases are often unsatisfactory, as the disease has usually progressed so far before treatment is begun that some deformity of the nose results, usually a sinking in of the bridge and flattening of the also, giving rise to the so-called "saddle-back" deformity.

EPISTAXIS.

The hemorrhage may come from any part of the nasal fossae, but it is generally from the anterior nares, and most frequently from the results of the septum. Epistaxis is a rare symptom in the hemorrhages of the newly bern, and when present suggests syphilis. It is infrequent

throughout infancy, but in childhood it is quite common, occurring in how more frequently than in girls. In the latter it is especially common about the time of puberty. Children who are kept much indoors in overheated apartments, and who have succeptible mucous membranes and flabby tissues, are particularly prote to it. The coorting cause may be a local one, like a fall or blow a epistasis may be due to picking the ness, or to any kind of mechanical irritation; it may be associated with much catarrh; and it is aften caused by a small ulter upon the septum. An attack may be brought on by mental or physical excitement. It occurs as an occasional, often an early symptom, in typhoid or malarial fever, in mensiles, or during severe paroxysms of pertussis. It is seen in the hemorrhagic form of all the eruptive fevers, in certain cases of liphtheria, in hemophilia and scothutus, in grave attents, leukemia, and in diseases of the heart and blood vessels.

Symptoms.—Epistaxis is frequently preceded by a sense of falness or pain in the head, which is relieved by the bleeding. The blood is usually from one nestril, and comes slewly by drops. The amount lost is generally small, but it may be large enough, when repeated, to produce a serious grade of anemia even in strong children; the hemorrhage may even prove fatal. Epistaxis may be overlooked if the blood finds us way into the pharyux and is swallowed. In most of the cases the hemorrhage ceases spontaneously in from ten to twenty minutes, requiring at longer or shorter intervals, according to the nature of the rame. Hemorrhage from adensed growths of the pharyux may closely resemble that from the rose, but otherwise there can rarely be any difficulty in recognizing spistaxis.

Prognesis.—This depends upon the cause. In the great majority of the so-called idiopathic cases epistaxis is not serious. Occurring early in the course of one of the infectious diseases, it does not ordinarily affect the prognesis unless it is very severe. When it occurs late, however, it is always a last sign, and particularly so in diphtheria. It may be serious in any of the hemorphagic diseases or in diseases of the blood, when it is not infrequently a cause of death.

Treatment.—To remove the predisposition, a child should receive general tonic treatment, especially plenty of outdoor exercise, and every means should be taken, by the use of cold baths, friction, and proper food, to tone up the vascular system.

An efficient means of arresting the homorrhage is compression of the nose between the thursh and finger. This may be combined with the application of ice over the nose, and sometimes small pocces of ice may be introduced into the postrils. The application of cold to the back of the neck or its use in the mouth may be of arvice by exciting reflex contraction of the capillary vessels. All tight elething or bands about the neck should be beenered, and the patient kept quiet in the sitting posture. After the hemorrhage has coased the rhild should not blow his nose for some time. Epanephrin is one of the most efficient local means of checking the blooding. Another valuable remedy is the peroxid of hydrogen, used full strength. If blooding continues in spite of all the above measures, the anterior mays should be plugged, and if this does not control it, the posterior naive should be plugged. Usually very little effect is seen from drugs given internally, although in frequently recurring bencerhages where no local cause can be discovered, calcium lactate should be tried; from thirty to sixty grains a day should be given to a child of five years.

The subcutaneous use of horse scrum often has a very decided effect in controlling those betterringss which do not yield readily to the could treatment. From 20 to 30 c.c. may be given to a child of five years and repeated every few hours if blooding continues. Human scrum is even more efficacious. In very severe hemorrhages transfusion may be necessary. In severe cases of usual hemorrhage eventring at short intervals without any apparent cause, after of the septum should be suspected, and, if present, should be touched with chromic acid.

CHAPTER II

DISEASES OF THE LARYNX

The characteristic feature of laryngral disease in infants and young shildren is the association of muscular spoom with every form of inflammation. Often it is the laryngral spoom, rather than the inflammation, which gives rise to the principal symptoms. This spoom is only one expression of the great reflex irritability of young children.

CATABRHAL SPASM OF THE LARYNX

(Spannodic Laryngitis: Spannodic Crosp; Catarrial Crosp)

The term caterrhal spass is fairly descriptive of this disease, which is characterized by a very mild degree of cutarrial inflammation associated with marked larguageal spasse.

Etielogy.—It is not often seen during the first six months, but is frequent from this time up to the third year. After five years it is rare. It occurs rather oftener in children who are well neurobed. Certain children have a predisposition to such attacks, those who have had one attack are likely to have others. The condition has many points of resemblance to spasmodic asilina which may replace it in later childhood. Heredity seems to have some influence in producing this extreme susceptibility of the air passages. Catarrial spasm of the largux is very frequently assecuted with enlarged tossils and advased growths of the phargus, sometimes with an elongated uvula. The exciting cause may be exposure to cold, especially to high winds, or an attack of indigention. There is no doubt that cutarrial spasm of the largux is seen at the present time much less frequently than formerly; the reason for this is not clear,

Lesians.—The catarrhal inflammation of the largus affects chiefly the parts above the encle; there is congestion and dryness, and later increased secretion of mucus. To this there is added a spasm of the muscles of the largus. There is no submucous infiltration, and no

tendency to edema of the glottis.

Symptoms.—The attack may be preceded for several hours by slight bromerous, or by a hasal discharge. During the day the child may appear perfectly well. Usually there is heard during the evening a hollow, barking cough, at first infrequent and not severe. About midnight this is apt to increase in severity, and there is now difficulty in breathing. As soon as this becomes marked the child wakes, and presentthe characteristic symptoms of an attack. In the mild cases the dyspaca is not sufficient to waken the child. In severe cases there is marked dysposu, especially on inspiration, and a bond strider as the air is drawn through the narrowed opening of the glottis. This may often be heard in an adjoining room. There is seen on inspiration deep procession of the suprasternal fosse, the supraclavicular spaces, and the epigastrium; also depression of the intercortal spaces, and even of the walls of the chest. Any excitement increases the spasm and aggravates the dyspace. The distress may be great; the breathing usually slew and labored; the voice boarse, but rarely lost; the cough striduless, boarse, and metallic; the gulse rapid; the temperature normal or slightly clevated, rarely over 101° F. There may be elight lividity of the farertips and of the lips, and sometimes considerable prostration. In the course of three or four hours the attack slowly wears away and the child falls asleep. During the following day, saide from slight boarseness and occasional cough, he is apparently well. Most of the cases are not so severe as this; there are the crompy cough, the honveness and general discomfort, but not marked dyspusa. On the second night there is a repetition of the experience of the first, usually quite as severe unless affected by treatment; and on the third day a remission similar to that of the day previous. On the third night the attack, if it seems at all, is generally a mild one. Slight hoarseness persists for several days, but otherwise the child is apparently well. Many children have such attacks every few weeks in the course of the cold season, the slightest exposure or an indiscretion in diet being sufficient to induce one.

Prognosis.—This is good, the disease never proving fatal, although nothing is more alarming, at least to parents, than to witness for the first time one of these severe attacks of cutarrial crosp.

Diagnosis.—Catarrhal spasm may be confounded with laryngismus stridulus, acute entarrhal laryngitis or with membranous croup. Laryngismus stridulus occurs only in infancy. In it there is not simply stridulous breathing, but periods of complete arrest of respiration. These may be repeated many times during the day, and may continue for weeks, being often complicated by carpopedal spasm, sometimes by gencral convolutions.

From acute entarrhal laryngitis and membranous laryngitis, catarrhal spasm is distinguished by its sudden onset, the mildness of the symptoms of inflammation, the spasmodic character of the dyspaca, and the daily remissions. The history of previous attacks will often aid in diagnosis. In case of doubt, a positive diagnosis can often be made by allowing the child to inhale a little chloroform. This at once relieves dyspaca due to spasm, while it has scarcely any effect upon that due to inflammation or membrane.

Treatment.—The purpose of treatment during the attack is to produce relaxation of the largugeal spasm. This is accomplished by the use of emetics, steam, and but fomentations over the largus. To produce vometing, ipseuc is the safest drug. This may be given in the form of the syrup, one-half temperondul every ten or fifteen minutes to a child of two years until temiting occurs, or it may be combined with ten or fifteen drops of the wine of antimony. The latter should not be repeated more than once or twice as it may produce serious depression. When given at longer intervals these remedies are useful in relaxing spasm without causing emeass.

Emeries have a double value if the attack is due to indigestion. If
there is constitution, an enema should be given. Following the free
comiting there is generally some improvement in the symptoms, but
there may be a recurrence of the spasm unless other means are employed. To prevent this, antipyrin is one of the most useful drugs.
One grain may be given to a shild one year old. This may be repeated
every two hours if necessary. Quite as much relief as that obtained from
the drugs mentioned is seen from the use of steam inhalations. For
this purpose the child should be placed in a closed tent, and steam introduced from a croup kettle. This may be used in conjunction with other
measures, and continued as long as necessary. Positions or hot fomentations over the largest are also useful. In one case in which severe

spasm had recurred for sight successive nights in spite of everything that was tried, the child being in great distress from the dysposa, intubation was performed with instant relief. Trachostomy, however,

would scarcely be admable.

During the flay following the first night attack, the child about be kept in a warm room, and it is well to continue the speak in does too small to produce coniting. After 6 c.m. the does should be doubled, and at testime two grams of antipyrin given. If so treated, the symptoms may not recur upon the second night, or there may be only the cough without the severe dyspace. The child should be confined to the house for two or three slays after one of these attacks, the drugs being gradually reduced; but the antipyrin should be given at bodtime for three or four successors nights.

To prevent a repetition of the attacks and remove the tendency to them, it is most important that the child should have plenty of fresh air and cold bathing, repetially cold spenging about the neck and check Everything which experience has shown to bring on the attack should be carefully avoided. Local causes, such as adented growths and hypertrophical totalls, should receive appropriate treatment. Generally it is not necessary to exclude fresh air from the deeping name. Although as open window on a cold, damp night may senetimes excite an attack, plenty of fresh air regularly given tends rather to diminish the energtridity. If the child's condition is poor, general tends treatment is to be employed.

ACUTE CATARRHAL LARYNGITES

Acute laryngitis is not so frequent as the disease just described, although it is much more severe, and may even be fatal. It occurs especially in children from one to five years of age, usually in the cold season. Predisposition to attacks is induced by the same conditions as in the case of acute rhmitis. Catarrial larragitis may be primary, when it is usually excited by cold or exposure, or it may be secondary to measles, influenza, scarlet fever, or other infectious diseases. It may also be of transmatic origin, from the inhalation of steam or irribating gases.

[&]quot;The following case is a good illustration of a surere strack extend by cold:
A rather deficate infant, eight months old, was taken out, with very seatly covering, on a raw December day. In a few hours houseness and strates were noticed, and the temperature was 101° F; there hours later it was 100° F, and mapite of the usual remedies which were employed the drapase had exade such a degree as to require intubation. The take was worn only these days and the child made a prompt recovery.

Lesions.—There is a no-derately intense congestion of the laryngeal mucous membrane, sometimes general and sometimes bealized. This may be seen with the laryngoscope, but is not always visible after death. With the congestion there are swelling and dryness, followed by increased secretion. In the milder cases the precess is limited to the mucosa. In the more severe cases it involves the submucosa also, which is congested, edemators, and may be infiltrated with cells. The changes are especially marked in the lymphoid tissue of the subglottic region. The swelling may be sufficient to produce a very marked degree of laryngeal stensois. In many mild and in all the severe cases there is associated catarrhal inflammation of the tracker, and often of the larger broachs. In young children there is very little tendency to relema of the glettis.

Symptoms.—In the mild form, such as that which is usually seen in older children, there is betterness, or even less of soice, and a laryngeal cough which is sometimes hard and tessing and always worse at night. There may be pain and soreness over the laryna. Constitutional symptoms are mild or absent, the patient not usually being eick enough to go to bed, and often rebelling even at being kept indoors. The duration of the disease is from four to ten days, with a strong tendency to relapses from alight causes.

The severe form of catarrial laryngitis is sometimes proceded by acute coryna, or there may be mild larynged symptoms for a few days before the development of the more severe ones. In other cases the discuss develops rapidly and severe symptoms are present within a few hours from the onset.

When the case is fully developed the voice is metallic and hearse, and occasionally but not usually lost. There is a hourse, dry, barking rough, which is very distressing, and sometimes almost constant. The cough, like the voice, is stridulous, and more or less strider is present on inspiration. There is a slight amount of constant dyspusa, but this is scarcely naticeable unless the chost is bared. Severe despute occurs in paroxysms, usually at night. Then, we may get the signs of obstructive despusa similar to those mentioned in severe attacks of catarrhal spasm. This dyspines is chiefly imporatory, but in some cases it increases steadily from the beginning of the attack, and may be indistinguishable from that the to membrane. Constitutional symptoms are usually present and may be severe. The temperature ranges in most cases from 101° to 103° F., but may go to 104" or 105° F. The pulse is rapid and full and respiration is accelerated. Children semetimes complain of pain in the larenx and traches which is increwed by coughing. The symptoms are sewer for two or even three days, the fever continuing with moderate prostration and pareayons of dyspnen, sometimes even attacks of sufforation and cranesis. Usually after two or three days there is a gradnal subsidence of the dyspace and the inflammatory symptoms, and the case goes on to recovery. At other times the inflammation extends downward to the large and then to the small broachi, and finally results in broachopneumonia. This attack may prove fatal from larguageal obstruction due to swelling and spaces.

Diagnosis. This disease is shiefly to be distinguished from menbranous larengitis. The onset of the two diseases may be very similar, and for the first twelve hours we have no absolute means of distinguishing between them, except possibly by the use of the laryngoscope, which is often conclusive in older children but not usually so in infants. All cases, therefore, should be looked upon with a degree of apprehension, The temperature in the esturnal is usually higher than in the menbeanous form. The dyspaca is mainly paroxysmal, with daily remissions and nightly exacerbations, and is chiefly inspiratory, while that of membranous laryngitis is constant, steadily and often rapidly increasing, and is present both on inspiration and expiration. In catarrhil laryugitis the voice is not usually lost, but in the membranous form this is the rule. There can be little room for doubt when there are enlarged glands, membranous patches on the tensils, and rusal discharge. Very edten, however, all these evidences of diphtheria are wanting, the really difficult cases being those in which the process begins in the laryny. The prevalence of diphtheria and a known exposure count for something in favor of membranous laryngitis. If cultures from the pharynx show the presence of Klebs-Loeffer bucilli, diphtheria of the laryax is certain; but no conclusions can be drawn from negative cultures. In catagonal as well as in membranous larvagitis there may be extreme dyspien. cyanosis, paller, prestration, and even death,

Progressis.—This depends somewhat upon the cause of the disease and also upon the age of the patient. It is much worse when it is ocoudary to measles or scarlet fever. It is better in children over three years of age than in infants, also when the general condition of the child is good. The prognosis in severe catarrhal laryngitis should always be guarded, not only on its own account, but also because it is imposible at first to be certain that the case is not one of membraness laryngitis.

Treatment.—In all cases children affected are to be kept in hed, and the temperature of the room should be between 70° and 72° F. The diet should be light and fluid, and the bowels should be freely opened. A het mustard foot both should be given at the outset. Antipyrin (one grain every two hours to a child two years old) is useful if there is much spannodic dyspusa. For this symptom emetics are beneficial, given as in cutarrial spann. The use of specar and squills in smaller does than is required for emesis (five drops each of the syraps of specar and equills every two hours) may give relief, especially in the early stage, when the cough is dru, hard, and severe.

All the remedies mentioned are to be regarded as accessories to the essential treatment, which consists in the use of inhalations. The child should be placed in a tent into which steam is introduced from a croup kettle. Simple steam may be used, so pins needle oil, compound tincture of bearsoin, time-water, or crossote may be added. In moderately severe cases inhalations should be used for fifteen minutes every two hours; in very severe once they should be continued the greater part of the time. Poultices or hot fomentations may be applied over the larynx. Belief is sometimes obtained by using counter-irritation by mustard. In our experience the local use of cold is very unsatisfactory, on account of the difficulty of applying it properly, and the objection to it on the part of young children. Stimulants may be required late in the disease, the amount of prostration being the guide to their use.

In cases of extreme dyspace operative interference may be needed. It is required more often in infants and young children than in those who are older. Opinions will of course differ as to when the dyspace has reached the danger point. One should not wait for general cyanosis. If pallor, marked prostration, and steadily increasing dyspace are present the case should not be allowed to go on without interference, even though one may be perfectly sure that it is one of catarrhal inflammation only. The severity of the dyspace is the only guide; cases at autopsy may turn out to be catarrhal, which were regarded during life as undoubtedly membraneus. If intubation is done, the tube can generally be dispensed with in two or three days. Convalencence is usually rapid, but there is danger of recurring attacks during the remainder of the cold season.

SUBMUCOUS LARYNGITES-EFFMA OF THE GLOTTIS

These two conditions are not quite identical, although they are closely associated and may be conveniently considered together. They are both rare in early life. In true edema of the glottis there is simply a drop-social effusion into the submiscous cellular tissue of the arytene-epiglottic folds, causing them to project as large rounded swellings on either side of the superior isthmus of the larynx. They may be of sufficient size to cause serious or even fatal obstruction to respiration. With the larynguscope they appear as pule-red tumors, lying usually in contact near the hase of the tongue. By the finger their presence can be quite readily distinguished. Edema of the glottic occurs principally in the late stages of nephritis.

In the inflammatory form of edona, or true submucous laryngitis, there is the same sort of swelling of these structures, but in this case it is due to some active inflammation in the neighborhood. The swelling is partly from the ofems and partly from cell infiltration. Usually all the parts serrounding the upper opening of the larynx are in a state of goate inflammation. The epiglottic may be swellen to the thickness of a farger and easily seen by depressing the tangue.

The exciting causes may be the mechanical irritation of a feerign holy, the inhalation of steam or irritating gases, erysipelas of the neck,

primary estarrhal laryagitis, or retrophuryngeal abscess,

The symptoms consist of great inspiratory dyspace with attacks of sufficiation, while expiration may be quite easy. In true edems there are in addition the symptoms of the primary disease. In the inflammatory form there are the evidences of beal inflammation—hourseness, rough, pain, and difficulty in avallowing. A positive diagnosis may be made by a digital examination. The symptoms may develop with great rapidity in either variety, and frequently prove fatal in a few bours.

The treatment of true edema consists in scarification or multiple puncture, the application of ice extermilly, and even the swallowing of ice; in the inflammatory form, in addition, local blood-letting by leacher and, as a last recort, trachectorny. Intubation is uncless in either form

CHRONIC LARYNGITIS

The following varieties are seen: (1) A simple form usually associated with adexed regetations of the pharyux; (2) tuberculous; (3) syphilitie; (4) that associated with new growths.

- With Adensid Growths of the Pharynx.—This is not uncommon. A slight superficial catastrial inflammation develops, the symptoms of which may continue for many months. These cases are often treated for a long time unsuccessfully by the use of sprays, inhalations, etc., but the symptoms disappear rapidly after the removal of the adensit growths. Similar symptoms may be associated with hypertrophic rhinitis. In this also the treatment should be directed to the primary condition.
- 2. Tuberculous Laryngitis.—This belongs to later childhood, and is rare even then. In infancy it is almost unknown: Rheindorf has reported a case in a child of thirteen months, which was regarded during life as syphilitio, but was shown by autopsy to be interculous. Of sixteen cases in children, reported by Rilliot and Barther, none occurred during the first three years, and only four before the seventh year. The

larynx alone may be affected, or the larynx and trackes, or the larynx, trackes, and lungs. Pulmonary tolerculosis is usually found to be present at autopsy, even though there may have been no pulmonary symptoms. Denime has reported a case of tuberculous laryngitis in a boy of four years whose lungs were healthy, death resulting from tuberculous meningitis.

The symptoms are boarseness, aphonia, laryngoal rough, and mucopurulent, sometimes bloody, expecteration. The spatum may contain tubercle bostill. With the laryngoscope tuberculous deposits may be seen, but more frequently there is tuberculous alteration of the mucous membrane. In children this is negally superficial, the deep destruction alteration seen in adults being very rare.

It is to be differentiated from syphilis chiefly by the general symptoms, as the laryagoscopic appearances may be very similar. Local treatment is seldem recessary and only with older children. It should be in the hands of a specialist.

3. Syphilitic Laryngitis.—In the early stage of syphilis the larynx is often the seat of a catarrial inflammation, which presents nothing especially characteristic except its protracted course. The laryngitis of late hereditary syphilis is quite rare, and is likely to be overlooked because of the difficulties in the way of a thorough examination, and because the disease is usually painless.

Strause has collected fourfeen cases between the ages of three and lifteen years, and added three of his own. He states that deep scaled processes are much more rare than among adults. The puris most frequently affected are, first, the epigiottis; secondly, the aryteno-epiglottic folds; thirdly, the posterior laryngeal wall. The epiglottis was involved in twelve of fourteen cases. Usually there was only perichondritis; in the more severe cases there was portial or complete destruction of the cartilage. In four cases jupilismatous masses were seen. In five cases the process extended from the epiglottis to the epiglottic folds of one or both sides. In several instances the superior rocal conds were thickened from hyperplasia, and occasionally small tumors were formed. In only one case was there observation of these folds. Changes in the tocal cords and the aryteneid cartilages were now, occurring only with extensive inflammation. The symptoms are those of chronic largingities: hearseness, semetimes aphonia, and in a few cases chronic laryngeal stenosis. The diagnosis can be made only by means of the larragoscope. In most of the cases there are present afcerations of the pulate or urnla, or sours from previous ulexes; correctimes the disease extends into the nose. Serious symptoms often result when to old syphilitic legions there is added acute largugitis or ofems.

In addition to the usual constitutional remedies for syphilis and

to the means ordinarily employed for the relief of abronic laryngitis, intubation may be required in these cases for the relief of laryngeal atenosis. The tube must usually be worn for many months.

NEW GROWTHS

New growths of the laryex are not very rare in children. Earliding the granulations which follow the use of the tracheal randa, the only one that is likely to be met with is popillona. This may occur even in infancy. According to Rauchfuss, the majority of the cases begin during the first year. Boys are more frequently affected than girls.

The symptoms depend upon the size and location of the tame. The earlier annifestations are usually ascribed to chronic laryngitis. There is hoarsoness, sometimes loss of voice, and a paraxysmal cough; later, dyspical develops which often increases by paraxysms. The symptoms are slowly progressive, and it may be several months before they are edficiently severe to attract special attention. A positive diagnosis is made only by the laryngoscope. There is seen a whitish granular tamer or tumors, sometimes pedunculated, sometimes with a broad base, which may be attached to any part of the larynx. The prognosis is usually serious on account of the danger of broachopmeumonia after operation.

The treatment of these cases belongs to the specialist. Operative removal of these papillomata usually results in their recurrence in increased numbers. For this reason operations through the mouth have been largely given up. Papillomatous tensors will often disappear entirely if complete rest for the largenx is secured by means of tracksotomy; but the tube must be worn for from six mouths to a year. Radium has been used in a few instances with brilliant results, the tuner disappearing after a single application and not recurring; but extensive cication tion has also been reported.

FOREIGN BODIES IN THE LARYNY AND BRONCHI

The aspiration of foreign substances into the largex is not an uncommon accident in children. It usually happens from an attempt to cough, laugh, or cry while the child has something in his mouth. If the body is sharp and irregular, like a pin, the shell of a nut, or a fragment of home, it is liable to become impacted in the largex. If smooth, like a pen or a bead, it is usually drawn into one of the brouchi, generally the right.

When the body enters the larynx there is immediately excited a

violent paroxyomal rough, with dyspnes amounting almost to suffocution. Often the body is dislodged by this initial attack of coughing. If it becomes impacted in the largus, it may cause sudden death by occluding the glottis; elsewhere it may excite acute larguagitis, usually of considerable severity.

The impartion of a foreign body in one of the primary bronchi, or one of the lobar divisions, is indicated by cough and a severe localized pain in the cheet. There may be expectoration of blood. On guaralitating the chest, there is found an absence of respiratory murmur over one lung or one lobe, according to the situation of the foreign body. Percussion usually gives marked dolners, the signs thus suggesting pleural effusion; or there may be increased resonance, which may even be tymputitic, swing to diminished tension in the part of the lung involved and to the emphysems which rapidly develops in the surrounding lung. If the foreign body remains impacted in one of the broucht, it usually excites a localized inflammation, which may terminate in the formation of an abscess. This may result fatally, or there may follow a prolonged illness, with hectic symptoms resembling pulmonary tuberculosis; and finally, after weeks or mouths, the foreign body may be expelled by an attack of coughing, and the patient recover completely. In other cases no abscess develops but there are repeated attacks of acute presmonia which never entirely resolve so that chronic preumonia of an intense degree develops. The general bealth is greatly interfered with and the child usually succumbs to one of the recurrent acute attacks.

The diagnosis of a foreign body in the laryax is made by the enddenness of attack and the violence of the early symptoms. In older clotdren the body may be seen with the laryagescope, but in young children this is very difficult. The position of a metallic or solid body may be revealed by the X-ray. The prognosis is always doubtfut, and depends upon the nature of the foreign body and the point at which it has been arrested. The usual cause of death either with or without operation is bronchepneumonia.

The first thing to be tried is inversion of the patient. By this means, assisted by the cough, the foreign body is not infrequently expelled even though it has passed below the larynx. The symptoms of laryngeal obstruction may call for immediate trachestomy or laryngolomy, intulation not being applicable to these cases. If, after trachestomy, the foreign body can be located in the larynx, but can not be extracted through the tracheal wound, the thyroid cartalage should be divided in the median line. The removal of a foreign body from the brenchi or the tracheal bifurcation should be attempted only by one skilled in been choscopy.

CHAPTER III

DISEASES OF THE LUNGS

THE PECULIARITIES OF THE LUNGS IN INFANCY AND EARLY CHILDISOOD

Therax.—The general shape of the thorax is somewhat cylindrical, the conical or dome-shape of the adult thorax not being attained until polecty. The antero-posterior and the transverse diameters are nearly equal in the nearly born, but after the third year the transverse diameter is always greater, the difference increasing steadily up to adult life. On account of the shape of the chest, the lungs are situated rather more posteriorly in the infant than in the adult.

The theracic walls are very elastic and yielding, swing to the outihighests condition of a large part of the framework. They are relatively thinner than in the solult, chiefly from the imperfect development of the theracic muscles. The greater part of the thickness of the thoracic walls is due to the deposit of fat, generally abundant in well-morrished infants; but where the fat is scanty the walls are extremely thin. The capacity of the thorax is considerably excrueded upon by the high postion of the disphragm, the large size of the thymna gland, and the frequent distoution of the atomach and intestines.

Bespiration.—According to Uffelmans, the rapidity of repiration during sleep at the different ages is as follows:

At birth	poposition o man	35 per minute.
At two years.	the first year	25 + +
At six years.	Marrier Control	22 1 1

During waking hours this rate is very materially increased, and from comparatively slight disturbance it may be nearly twice as rapid.

The type of respiration in infants is disphragmatic, and it continues to be chiefly so until after the seventh year, when the costal element gradually becomes more and more prominent. The rhythm of respiration is easily disturbed. In very young infants the regular rhythm is seen only in sleep. The lungs do not always expand equally; at certain times and in certain positions respiration may be carried on for a few moments almost entirely with one lung. For some moments it may be very superficial, and then quite deep. The length of the interval between

impiration and expiration varies much at different times. Regular rhythmical respiration is not fully established before the end of the second year. After this time disturbances of rhythm are due sheefly to pulmonary or cerebral disease; but in infancy quite marked irregularity may have little ur no significance. It is very common in all asthemic conditions.

Structure.— As compared with the udult, the traches of the young child is larger; the broachi are larger and eccupy a greater space; the air cells are much smaller and occupy less space; and the interstitial tissue is much more abundant.

Physical Examination.—This requires tact and time, but yields results which are quite as satisfactory as in adults. It should be undertaken only in a most having a temperature of about 70° F., or before an open fire.

Imperfice.—This should be made with the chest bare. There should be noted, the shape of the chest, the presence of deformities from rickets, the want of symmetry in the two sides, bulging of the intercestal spaces, whether the two lungs expand equally or not, also variations in rhythm, and the presence and extent of any recession of the soft parts or bony walls as an indication of obstructive dyspness.

Palpation.—This also should be made upon the bare skin, always with the hand well warmed. Although we can not get the fremitus of the ordinary voice, we can get that of the cry. This is usually more intense than in adults, on account of the thinness of the chest walls. We frequently get a broughtal fremitus—a vibration produced by macus in the tubes. The position of the spec beat of the heart should be determined, it being remembered that in infancy this is normally in the manumary line, or just inside of it, and usually in the fourth intercostal space.

Percussion.—For the examination of the back, the child may be laid face downward upon the nurse's lap, or be seated upon her arm. Yor the front and the lateral regions of the chest, the child is most conveniently placed upon his side across a hard pillow. The percussion blow must be light, either with a single finger or a small percussion hammer Percussion should be made both during inspiration and expiration. The normal percussion note is comewhat tympanitie, this being due to the relatively large branchi and the thin chest walls. This note is exaggerated in the interscapular region and beneath the clavide, repecially upon the right side. Here crucked-pot resonance may be obtained even in tealth.

Amenfation.—This may be practiced with the taked car or with the stethescope. A stethescope is absolutely necessary for a thorough examination of the spaces of the lungs in front and the axillary regions. Most children are less frightened by the instrument than by the head of the physician during anterior association.

The normal respiratory marmor of the infant is generally described as "puccile," In quality this has been likewed to the broughts breathing of the adult, but the resemblance is not a very close one. It is rule, rather load, and seems very mur the car. Its peculiar character is due to the fact that the tracked and broughts arounds are more distinct, because not transmitted through so thick a layer of lung and chost wall. It is especially load in the regions where the brought are superficial, as between the shoulder-blades and beneath the clavicles, particularly of the right side. A careful comparison of the two sides of the class will generally enable an observer to avoid errors. The irregularity of rhythm which occurs from slight causes should be remembered, and the infant's position changed several times during ancultation, to avoid the mintake of attaching too much importance to a feeble respiratory marmor of one side.

On account of the thinness of the chest walls, there is difficulty in distinguishing between rides produced in the broncht and pleuritic feation sounds. Before drawing any inference from the amendatory signs, both longs must be examined for several minutes, changing the child's position, and often inducing a cry or compelling a deep inspiration by other means, in order to bring out signs which otherwise may be overlocked. As asscultation is extremely difficult or impossible in a crying infant, this part of the physical examination should be made first if the child is quiet, since upon at we must chiefly depend for diagnosis. Inspection and percussion can be deferred until later.

Peculiarities in Disease.-There are coveral peculiarities connected with the respiratory organs in infancy and early childhood which must be constantly home in mind in studying their discuses. The muscular development of the thoracic wall is feeble. The soft, yielding character of the thoracic framework curses the chest to sink in reality from atmospheric pressure whenever there is obstructive duspness. On account of the small size of the air vesicles, acute congestion may interfere with their function almost as completely as does consolidation. Because of the delicate walls of the air vericles, emphysems in readily produced in obstructive dyspace, but it is earely permanent. There is a tendency to collapse, either on the part of lobules or groups of lobules, but very rarely of an entire lobe. This is a much less important factor in the production of symptoms in acute pulmonary disease than many writers would lead us to suppose. The tendency of inflammation to spread from the large to the small brought is much greater than in adults. In all forms of pulmonary disease the rapidity of respiration is much greater than in adults. Areas of consolidation often exist without appreciable changes in the percussion note, because they are superficial and are surrounded by healthy or emphysematous lung. Flatness should always suggest the presence of fluid.

Probably the most remmon mistakes are to confound bronchial riles with friction sounds, exaggerated payrile breathing with bronchial breathing, and to overlook the existence of fluid because of the presence of bronchial breathing.

ACUTE CATARRHAL BRONCHITIS

Acute catarrhal branchitis is one of the most frequent conditions for which the physician is called upon to prescribe in children. It occurs at all ages, from surly infancy up to puberty. Its frequency, however, diminishes steadily after the second year. The predisposition to acute broughtis exists with the same constitutional conditions, and is acquired in the same names as the predisposition to the neuto catarrhal inflamnations of the upper respiratory tract. (See Acute Ehinopharyagitia.) Brenchitis is very common in children who are suffering from rickets and malnutrition. It is much more frequent in the reld months, especially in the late winter and early spring, when there are sudden atmospheric changes and high winds. The presence of large tonsils and adenoid regetations of the pharyux are important predisposing causes.

Brenchitis may be a primary or a secondary disease. The primary form is excited by cold, exposure with insufficient clothing in severe weather, wetting of the feet, or challing of the surface is any manner. Under these conditions it may occur alone, or be associated with or preceded by acute estarth of the ness, pharyax, or largus. In rare cases it is caused by the inhalation of irritants. Bronchitis is an almost invariable accompaniment of measles and influents. It is very common in perfussis, in searlet and typhoid levers, and diphtheria, and may occur in any acute infectious disease; it also complicates preumonia and pleurisy. The microorganisms associated with bronchitis are chiefly the staphylococcus aureus and the preumoneceus, often in combination; next in importance are the streptococcus and, especially in protracted cases, the influents bacillus.

Lesions.—Acute cutarrhal broachitis is an inflammation of the mucous membrane of the broachi. As a rule it is belateral, both sides being involved to the same degree. Localized broachitis is secondary to some other pathological process in the lungs, usually tuberculosis, old pleuritic adhesious, or pneumonia. In acute broachitis only the larger tubes may be affected, this usually being complicated with inflammation of the traches (ordinary trachesbroachitis); or, in addition, the process

may extend to the medium-smed tubes (severy broachitis); or, in infants represently, it may extend to the smallest tubes (capillary broachitis). In the last-mentioned form there are invariably changes in the notes of air venicles surrounding the broachi, and these cases are therefore—more properly classed as broachopseumonia. In the first form the instrumention is superficial, and affects only the micross membrane of the broachi. In the second form it may involve the entire thickness of the broachial wall, and in the third form it does so regularly.

The pathological changes consist in congestion and swelling of the missons membrane, desquariation of the spithelium, and an exudation of missos and possedly. At autopsy the injection of the missons membrane is usually distinct; possend missis cover the surface of the larger brought, and by pressure once from the cut extremities of the smaller tubes. The chief holics of the walls of the brought consists in an infiltration with honoscytes. In infants dying from humahatis, the lungs are much more frequently emphysematous than reliapsed. In fact the realisess with which emphysema occurs in beanchitis is one of its distinguishing features in infants. However, this is rarely permanent but usually subsides rapidly after the neute attack is over. There is swelling of the lymph nodes at the root of the lungs, which in most of the neute cases is slight, but in protracted cases, and after neutring attacks, may be quite marked.

Symptoms.—It is communicat to consider separately the symptoms in infants and in older children.

THE BROXCHITIS BY INPANTS .- 1. The Mild Form (Browchitis of the Larger Tubes.)-The coset is generally gradual, and the symptoms of broughitis may be preceded by those of cutarris of the nose, pharyax, or larvay. The change in the character of the cough, the slightly acexterated breathing, and a further rise in temperature, indicate an extension to the bronchi. The cough may be constant and severe, or very slight. There is no expectoration. The secretions are usually coughed up into the month or pharynx, and swallowed. This sometimes excites comiting. At other times the mucus is coughed only into the traches or larvay, and aspirated again into the langs. The respirations are from forty to fifty a minute, and often accompanied by a ruttling sound, due to miners in the large brenchi or traches. The general symptoms are not severe, and unless the infant is very young or very delicate no apprelensish need be felt as to the outcome. The temperature is generally from 1667 to 1657 F. for two or three days, then below 1000 F. A moderos amount of restlessness dependent upon the severity of the cough, acceptain, and sometimes comiting and diarrhea, are usually present.

The physical signs in the first stage are dry, sonorous râles ever the whole theef. A little later these give place to coarse mirrous râles heard

coveywhere, but especially distinct between the scapulae and in the infraclustrular regions. On palpation there is notally a marked broachiel fromitize. Often there is not enough dispuse to cause recession of the soft parts of the cleat. Unless the disease extends to the smaller broachi and the air vesieles, the illness usually lasts about a week. Course rides in the chest may remain for some time after the symptoms have subsided. Relapses are exceedingly common. In a delicate or rachitic child, or in one whose surroundings are last, one attack is likely to be followed by a succession of others, so that the child may not be really well until warm weather comes. The general health may suffer from the prolonged confinement to the house, although the patient may never have been seriously iif.

2. The Severe Form (Bronchitie of the Smaller Tubus) .- This diffem from the preceding variety mainly in the greater severity of all its. symptoms. The most may be like that just described, the severe symptions not appearing until the patient has been sick two or three days. or they may be severe from the outset. If the latter, it is indistinguishable from beardopneumonia. There is sough, despues, accelerated breathing, fever, and moderate, sometimes severe, prostration, cough is tighter, and more frequently of a short, tensing character than severe and paroxysmal. There is difficulty in nursing. Dyspassa may be quite marked and is shown by the active dilutation of the alse used and the recession of all the soft parts of the chest on inspiration. The responditions, as a rule, are from 50 to 80 a minute. The temperature for the first day or two is usually 100° or 102° F., but it may be 103° or 104° P. So high a temperature does not continue unless proumonia develops. The prostration is in most cases more closely related to the dyspace and the rapidity of respiration than to the temperature. Often there is slight evanosis.

In the beginning the chest is filled with sibilant and sonorous rides. In twelve or twenty-four hours these are wholly or in part replaced by moist rides—course or fine, according as they are produced in the large or medium-sized tobes. The ribes are always best heard behind, but they are present all over the chest. The abiliant and sonorous breathing may persist throughout the attack and for a week or two thereafter. This prominence of the spasmodic or asthmatic element in broachitis is characteristic of infancy and early childhood. The respiratory murmor is feeble; the resonance on percession is normal or slightly exaggerated. As the case progresses toward recovery, the finer rides are the first to dis appear.

At the onset of such a case it is impossible to say whether the disease will be limited to the medium-sized torouchi or will extend to the smallset brought and air traicles. In young or very deficute infants, and during measles, it is very common for the disease to spread rapidly to the air vesicles. In other cases, usually in infants under air menths old, there may develop attacks of respiratory failure or sufficiation. These may occur in a severe case at any time, and, because of the infant's inability to empty the toles of secretion, the dyspines steadily increases until the respiratory nuncles are exhausted. The symptoms which follow are mountly assembed to palmonary collapse. It is, however, by no means certain that this is the correct explanation, for at autopoies made in such cases the lungs are usually found to be the seat of neutr emphysems. The clinical porture is a clear one. There is no disposition to cough or cry; the pulse is feetle; the respiration very rapid, superficial, often irregular; the skin cyanotic, and often claiming. Finally, there may be added to the other signs, dulness, apathy, and stoper. Such attacks may come on quite subbands of those in robust infants, and unless the treatment is energetic, death often follows in a few hours, being frequently preceded by convulsions.

The usual course of the disease in infants previously in good health is that the severe symptoms continue for two or three days only, after which the temperature falls to 100° or 100.5° F₊ and gradually becomes normal. The constitutional symptoms usually decline with the temperature, and, except during the first thirty-six bours, they rarely give cause for anxiety. Recovery almost invariably occurs unless the disease on tends to the finer brought.

Branchitis is principally to be statinguished from branchopnessumia.

The differential diagnosis is more fully considered under that discuss. The most important points are that in presumonia the temperature is higher and more prolonged, the prostration greater, the rides very often bendized—being heard only behind, aften over only one long—the denation is more protracted, and all the symptoms are more severe. In nearly all cases of severe branchitis in young children some pneumonia is present.

THE RESOCCULTES OF OTHER CHILDREN,—This is not nearly so serious as in infants, because the same danger does not exist of extension of the inflammation to the finer bronchi and air cells.

1. The Mild Form.—This is very common. The constitutional symptoms are slight, and often entirely about after the first day. The patient is never sick enough to go to bed. The first symptoms are cough and soreness or a sense of oppression beneath the sternum. The cough is always werse at night. It is at first tight, hard, and racking; later it is lesse, and in children over five years old there is usually supertoration—first of white, frothy mucus, but after a few days it becomes more abundant, and of a yellow or yellowish-green color, from the presence of pus. The physical signs are only coarse rides, at first dry, and later maist, but

beard over both sides of the chest, in front and behind. There may be some disturbance of digestion, ancrexia, constipation, or distribute. The usual duration of the attack is from one to two weeks. If the patient is not kept indisors the disease may pass into a subscute form, lasting for several weeks as a profracted "winter cough," but without any other important symptoms.

Such prolonged or recurring attacks of broadditis of a subsente form should suggest influenza or inferencesis. A positive entanceus inferencian reaction renders inferences probable. A careful search for bacilli in the spatims should then be made. Although not found at first, if present repeated examinations will usually disclose them. Influenza can be diagnosticated with certainty only by spatims cultures.

2. The Server Form.—The coset is abrupt, with fever, chills, pains in the back, headarbe, cough, and sometimes pain in the chest. There is a feeling of tightness or constriction beneath the stermin. The onset resembles that of pneumonia, except that the symptoms are less owere. The temperature for the first two or three days ranges between 100° and 160° F. It is generally highest in the first twenty-four hours. The cough resembles that of the mild farm, but it is usually more severe. The expectoration is more profiner, and occasionally, in the sarry stage, it may be streaked with blood.

The coarse rales of the mild form are present, and in addition there are finer rales—at first dry, and later moist—board all over the chest. Frequently, wheesing rales are heard on expiration. The duration of the attack is ordinarily from two to three weeks, the patient being sirk enough to be confined to hed for three or four days only. There is frequently a cough for some time after all physical signs have disappeared. Relapses are easily excited by any indiscretion before the patient has quite recovered.

The prognosis in the primary cases is good, such almost invariably terminating in recovery, and very exceptionally passing into brenchopreumonia; but this not infrequently happens when the attack complicates measles or pertussis.

Treatment of Bronchitis.—To remove the predisposition to broughting the same means should be employed as those mentioned in Acute Rhimo-Pharyagitis. Children with tuberculous autocodents, and those who are especially prone to pulmonary disease, should, if possible, spend the winter in a warm climate. The alexpong apartments of enceptible infants should not be too cold—never below 55° F.—but they should be well centilated. It is important in infants and young children that mild attacks of broughting should not be neglected.

Every young shild who has an acute cutarrh of the nose, pharyny, largus, or branchi should be kept indoors. In every such cutarrh accom-

paried by fever the child should be kept in field while the fever lasts, even if the temperature does not go above 100.5° E, and is accompanied by no other constitutional symptoms. A very large number of the cases will remove premptly when no other treatment is employed than to keep the child in hell. Fresh are is independed. But the edvantages of cold air have not jut been demonstrated. According to our experience, the wide-open windows have no place in the treatment of sente broughitis in intents or young children in the winter and spring season. The temperature of the room should be about 20° F. The room should be well contilated and frequently aired, the child meanwhile being removed to mostlar noon. There is a great advantage in changing the child's position in the crib and from the crib to the name's arms. Careful attention should be given to feeding and to the condition of the breats. A cathaptic, preferably easter oil, should be admissistered at the conset.

Positives are objectionable and should not be employed. Counterirritation is very valuable. In infants, good results are obtained by the frequent use of a mustard paste (see chapter on General Therapeatics). The paste may be repeated, according to indications, from two to free

times a day. If properly used, it will not injure the skin.

Inhalations may, in the great majority of cases, take the place of the administration of drugs by the mouth, a very great advantage in infants. They may be used by means of the croup kettle, the child always being placed in a tent. In the early part of the disease inhalations, like simple aqueous vapor or lime-water, may be used. Later torpentine, cross-te, becasein, terebene, or enculryted may be added. Of these, cross-te mouthy gives the most satisfaction. Inhalations are to be used for ten or fifteen minutes from four to eight times a day.

In infancy, expertorants may advantageously be dispensed with. For older children, antimony and specie may be used in the first stage. When the secretion is more alcordant, crecools, turpentine, or berdene may be given. Small, frequently repeated doese usually give the best results. Oppose should be given continued to infants. The dry, harancing rough of the early stage sometimes yields to nothing so quickly as to small doese of Dover's powder (e.g., one-tenth of a grain every two hours to a child of one year). The use of emetics to get rid of broughted secretion is not to be advised. Stimulants are not required in most of the cases. The indications for them are the same as in pactnessis. When there is much despices of the asthmatic type, nothing works as well as epimephrin. It should be given intrammonlarly; the date is two to five minims of the 1-1,000 solution. The effects are almost intraminate, but often only transient.

Should attacks of sufficiention and respiratory failure occur in infants, the indications are to excite respiratory movements and to get as much

blood as possible to the surface and the extremities. Flagellation or spanking and the use, alternately, of but and cold douches to the chest will sometimes induce the deep respiratory efforts desired. Other useful measures are the lot mustard both and the mustard pack applied to the entire body. Probably the most effective of all remedies is sky cupping. The chest should be cupped front and back for five or ten minutes every few hours. Oxygen should be administered. As these symptoms are likely to recur every few hours for a day or two, a repetition of the breakment may be needed. For such patients rold air is injurious. They should be kept in a room with a temperature of 70° to 72° F.

In the non-febrile cases in older children, confinement in hed is unnecessary, but they should be kept induces. In the early stage, with hard, dry sough, one of the last remotion is brown mixture (the mistura glycyrrhine composits of the U. S. P.). It will be found advantageous in most cases to have the formula mode up with one-half the usual amount of openm. When the cough is especially hard and dry sahalations of steam are indicated. In the second stage, muriate of ammonin may be added to the known mixture; or berdene, two or three drops upon sugar, may be given four or live times a day, and inhalations should be used several times a day,

In the more severe cases the patients should be kept in bed and a counter-irritant to the chest employed. For the general discomfort, pain, benfache, etc., nothing is better than phemortin and Dover's powder (two grains of the former to one-half grain of the latter to a child of five years), repeated every three to six bouns. All putients should be kept in bed as long as the temperature is above normal.

After all physical signs and constitutional symptoms have disappeared. a cough continues sometimes for weeks. Expectoration is scanty, or is wanting altogether; the eargh is bard, dry, often parsoysmal, and in some cases occurs at night only. For this condition the last remedies are colliver oil and crossote. When these measures are not effective, a change of climate should be advised.

FIRRINGES BRONCHITTS (Avoschial Camp)

Fibrinous bronchitis is usually seen in diphtheria, as an extension from the largue or trackes. There is, however, another form of bronchitis attended by a fibrinous exolute, which occurs as a primary disease, This is very rare in children. Weil has, however, collected tweaty cases. of the primary form. The etiology is obscure. It is seen at all ages, from infancy up to puberty, and it may be either acute or chronic. From the cross thus far reported it would appear that the acute form is relatively more rommon in children than in adults. The disease may be confined to certain branches of the branchial tree, or it may affect all the branchi, even to the minute subdivisions. The fibrinous membrane is found losse in the tubes or adherent. There are generally associated other polynomisty changes, such as emphysema, atchectasis or bronchepneausonist.

The acute form samewhat resembles ordinary cotarrial broachitis. The diagnostic features are, the severity of the disputes and the espectoration of tube costs from the larger branchi, or elengated cylinders from the smaller case, the former resembling macaroni, the latter, termicelli. The expectorated masses are often in balls or plags, and their peculiar character is not recognized until they are placed in water. The easts are discolved by alkalis, especially by lime-water. After the expulsion of a large cast, improvement in all the symptoms occurs. They, however, return as the exudate reappears. The ordinary duration of acute cases in from one to three weeks.

In the chronic form there are no constitutional symptoms, left only dyspect and cough, often recurring an purocyons, with the expectoration of fibrinous casts. The patient may have these attacks at internals of a few days or weeks, extending over a period of months, or even years. There are no obstructoratio physical signs. The diagnosis rosts upon the peculiar character of the expectoration. The prognosis in acute cases is unfavorable, the mortality being 75 per cent (Weil). Chronic cases are not dangerous to life.

Treatment.—This is quite unsatisfactory. To loosen the membrane and facilitate its expulsion, the most efficient means are inhalations of the vapor of lime-water. Pilocarpin is too dangerous for use with small children. Occasionally emetics are of value. Improvement in some of the chronic cases has resulted from the use of itsilid of polassium.

CHRONIC BRONCHITIS

Chronic bronchitis is not a very common disease in children, particularly in young children, one reason being that chronic employerm, a frequently an associated condition in adults, is rather rate in early life. Chronic beauchitis always accompanies chronic pulmonary tuberculasis and chronic interstitial pneumonia, with an without the occurrence of bronchiectoria. It is seen in chronic cardiac disease, especially with lesions of the mitral value. It may occur as a late symptom of hereditary syphilis. Excluding the varieties mentioned, it usually follows attacks of seate bronchitis, the process becoming chronic because of the patient's constitutional condition or his unhygienic surroundings. The acute at-

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lack may be primary, but it often follows meader and whooping-cough. Deformities of the chest, the result either of rackets or of Pott's disease, are recusionally a cause.

Symptoms.—The only constant symptom is rough, which is persistent, obstinate, and nearly always worse at night or early in the morning. It often occurs in paroxysms strongly suggestive of pertussis. Expectoration is not generally abundant, but in older children it is usually present, and in a few cases it is profuse. A copious morning expectoration of fetial pass or muco-pass indicates bronchiertasis. There is no fever, bittle or no dysposu, and although the patients are thin, they are not emeriated, and in many cases the general health is not much affected. There may be rounse mucous riles, or no physical signs whatever. The duration of the disease is indefinite, depending upon the cause. All these patients are letter in summer than in winter, and suffer frequently from exacurations of areate or subscribe bronchitis.

The diagnosis is to be made mainly from pertussis and tuberculosis. From mild attacks of pertussis the diagnosis may be impossible except by the course of the disease. Tuberculosis may be suspected if the thermometer shows regularly a slight evening rise of temperature, if there is much anemia, and steady loss of fiesh. It may, however, be present without any of these symptoms. A positive autaneous reaction is suggestive, but a certain diagnosis can be made only by the discovery of tubercle baculli in the sputum.

Treatment.—The first indication is to treat the primary conditions upon which chronic bronchitis may depend. Attention should be directed to the general condition—nickets and malnutrition each receiving its appropriate treatment. In many cases a change of climate is the only thing which is really curative. The general health should be promoted as much as possible by a tonic plan of treatment which may advantageously include the use of cod-liver oil. The results obtained from drugs are not very satisfactory but the following may be employed: potassium iedial, crossote and terebene, the last two being given both by mouth and by inhalation. For the relief of cough opiates are to be avoided as much as possible.

ASTHMA

Asthma is characterized by attacks of severe spasmedic dyspace, which may be preceded, accompanied, or followed by a bronchitis of greater or less severity. In infancy, the association of asthma with besockitis is a very close one, and the cases present quite a different clinical picture from the disease as seen in older children, which differs in no essential points from the asthma of adults. Writers differ very much in their statements regarding the frequery of adding in early life, mainly because of a waist of agreement in regard to what shall be undested easier this term. The addinantic attacks of infants are considered by some as a stage of broachities, by others as distinct from that discuss. Typical attacks resembling those of adult life are rare in children, and extremely so before the lifth year. However, of 225 cases of nothing reported by Hyde Salter, the disease began before the benth year in nearly constitut the number.

Etiology.-The general or constitutional causes are the same in chilthen as in adults. Adding is often bereditary. It frequently occurs in children who in infancy have suffered from yearms. The local came may be any form of pritation in the new or pharyex-hypertrophic thinits, admost growths of the plaryny, appertrophied totalls, or clongital male our in the bouchful moves membrane, as a result of persons attacks of acute forentialis. It is probable that it may also be caused he the irritation of unlarged broudual glands. In susceptible children, a participant may be excited by high winds, dust, cold and damp air, indigastion, construction or the inhalation of substances such as the pollen of certain plants, especially regovered, golden-rod and roses. Centact with anomals, especially horses, cuts and dogs may also infitiate an attack. It has been recently shown, by Schloss and Tallot particularly, that certain fools, especially eggs and rarely milk, pork and other ments are responsible for attacks in certain children. There can be no doubt that this assemptibility to the police of plants, to centret with aximals and to various foods is a phenomenon closely allied to that of anaphylaxis. Unlancous and intracutaneous tests have shown not only the production of urticarial wheals, at the site of the test, but have also initiated attacks of asthma. In certain instances the susceptibility to those protein substances is inherited; in others it is perhaps the result of an active sendtiration, but in many instances there is no sufficient explanation as to low the child has become sensitized. The constriction of the brought, which causes many of the examplesos of authors, is probably chiefly due to the contraction of the unstriped circular muscular fibers in the walls of the becomic. Swelling of the murous moniteans, either by dilatation of the blood recels or by explation of the scrum into the miscom membrane itself undoubtedly is a factor of importance in some instances.

Symptons.—Four quite distinct clinical types of asthma are sen in children: (1) Cases which in their coset simulate attacks of broughtis; (2) those in which aritmatic symptoms follow an attack of broughtis, continuing for weeks or months, but not necessarily recurring; (1) hay fever, or the periodical form which occurs every summer; (4) that which resembles the ordinary adult asthma, with the nervous element prodominaling. The prominence of the catarrhal symptoms is class-

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acteristic of all forms of asthma in children, the first two varieties mentioned being peculiar to early life.

Attacks Resembling Acute Reprehities—These cases are rare, but may be seen even in infants. The caset is uniden, with medicrate fever, increased cough, severe dysposa, and sometimes cyanosis, prostration, and cold extremities. The closet is filled with somerous, sibilant, and soon with subscription rides. Instead of running the usual course of broachitis of the finer tubes, the symptoms may pass away very rapidly, and in forty-eight, sometimes in twenty-four, hours the patient may be quite well. It is only by the course of the disease and by recurring attacks that their true nature can be recognized. In infants this form of asthms may be tatal.

Cases Following Attacks of Broackitis-Caterrial Arthus.-This. form is not uncommon, though it is frequently designated by some other term than asthma-sometimes as spasmolic benefitis, or cutarrial sparm of the branchi. The symptoms are, however, indistinguishable from asthma, and they evidently belong in the same category. This form is usually seen in infants, being rare after the third year. Many of the patients are rachitie; others have large torsils, or adesold growths of the pharynx; while in still others there is every reason to suspect the presence of large brouchial glands. Usually there is nething psynhir about the antecedent bronchitis; in most cases it is not especially serere, and is limited to the larger tubes. The febrile symptoms subside in a few days, but the ouigh continues, as do also the dyspaca and wheezing. When the symptoms are fairly established they are very uniform and characteristic. The respiration is necelerated, negality to 50 pr 60, semetimes to 70 or 80, a minute. The temperature from time to time may be very slightly slevated, or it may remain normal. The respiration is noisy, labored, and accompanied by distinct whereing.

On amendation, there is prolonged experation accompanied by load, wheezing and sonorous, or sibilant rides, and occasionally course moist rides are heard. In cases which have lasted some time a moderate amount of emphysems can be inferred from the prominence of the infraclavicular regions, and exaggerated resonance over the chest in front and the de-

pression of the bases posteriorly.

These symptoms and signs often continue for three or four weeks. While they are constantly present, they vary in intensity from time to time, being usually much worse at night. The symptoms are always increased by exposure to a cold, damp atmosphere, by any fresh accession of broughtie, and often by trivial digostice disturtances. The coughts not usually severe, and expectoration in most cases is absent. The general health is often but little affected. With receiving from the asth-

matic symptoms the emphysema usually disappears gradually, although we have seen severe cases in which it persisted.

What proportion of these children afterward develop ordinary asthms, we are mable from personal experience to say. Some undoubtedly do, but in others which we have been able to follow, recovery has seemed to be permanent. This would appear more likely in those cases closely associated with rickets, or with other causes which disappear spontaneously with time or as a result of treatment.

Hoy Fener.—This is very rare before the seventh year and but few well-marked cases are seen before the tenth year. In its clinical aspects it does not differ assentially from the disease as seen in adults, except possibly by the greater prominence of the broughted naturely.

Ordinary Attacks of the Adult Type.—These usually occur at intercals of a few weeks or months, depending upon the nature of the secting cause. The beginning is negally at night with dyspace, a short, dry rough, and load, whereing respiration. Deep recession of the soft parts of the chest is seen, as in larguead sheasis. There is prolonged expiration, accompanied by load, someous, sibilant and whereing ribes, and the vestcular marmon is very feeble. Later, most ribes may be heard. After many attacks emphysema is present. This occurs more rapidly than in adults, and may be extreme, giving rice in marked cases to serious thoracic deformity. On account of the loss of skep and interference with nutrition, the general health may become seriously impuised. Uniteertal wheals are not infrequently present at some time during an attack.

Diagnesis.-Typical attacks of asthma are ensity recognized. Some of the entarrhal forms seen in infancy, however, present some difficulty, and a positive diagnosis may be impossible except by the progress of the case. The presence of articaria speaks strongly for asthma. The blood pictury in asthma is characteristic and of much value in dugnosis. The important thing is the presence of a large number of essinoshile cells. They may form as high as 15 to 20 per cent of the lexcocrtice. In a series of cases examined in one of our clinics by Wile, the average was 10.7 per cent; the highest observed being 26 per cent. The countphilis is greatest at the height of the attack. The blood examination serves to differentiate asthma from simple bronchitis and from tabeteslosis. The existence of marked cosinophilia definitely establishes the asthmatic character of some of these attacks in infancy. Rosinophile cells are commonly found in the sputum. Charcot-Leyden crustals and Unrechmann's spirals may also be seen but much less frequently and mently only in the sputum of older children.

Prognesis.—This is best in the cases of catarried asthma in infants, and in older putionis when it depends upon some local rause which can ASTRIMA 491

be removed, as when the discuse is due to reflex used or pharyngeal irritation. In the majority of other cases, asthma is likely to become chronic unless the child is removed to some climate in which the attacks do not occur. The younger the child, the shorter the duration of the discuse, and the less marked the hereditary tendency, the better the prognosis. In those children that are sensitive to the pollen of plants and to certain foods there is reason to believe that specific treatment by immunication may be of benefit. The results with hay fever have been encouraging and Talbot was able to prevent, or diminish greatly, the attacks in some of his patients especially those who were sensitive to talk.

Treatment.-The nose and the thinopharyns should be carefully examined in every case of asthma, and any pathological condition there present should receive attention as the first step in the treatment. Importance, in children, should be attached to the removal of adenced growths of the plurens. We must admit, however, to have seen very few cases of asthma cured or even greatly improved by this means. During attacks, the best means of relieving the symptoms is the inhabetion of fames of nitre paper or stramonium leaves. Most of the proprietary remedies contain these ingredients. The alceping room may be filled with the fumes of these substances, or the child may be placed in a tent into which the fumes are introduced. Emetics may be complored when the attack is brought on by indigestion. To prevent the recurrence of night attacks, antipyrin is valuable given in full closes at bedtime-four grains at five years and six grains at ten years. Between the attacks the syrupof bridriodic soid (for a child of five years one-half teaspoonful, t.i.d.) or potassium todid (gr. ii to gr. iv, ti.d.), may be given for a number of weeks. Tonics are often useful. Those especially valuable in asthmutic patients are cinchonidia (gr. ii, t.i.d.) and arsenic (gr. 1-100, t.i.d.). They may be advantageously combined. Cocain used locally in the throat and opium by mouth or hypodermically will often cause a cessation of attacks but are objectionable with older children on necount of the tendency to the formation of a drug liabit. On account of their susceptibility to the drug, coesin is dangerous with infants and very young children.

In the severe neute attacks nothing gives so much immediate relief as the use of spinephrin intramuscularly—dose Wv to Wviii, for a child of

three years.

In the cases of catarrial asthma following broachitis, expectorants and ordinary cough remedies are useless. Cod-liver oil and the lodid of potamium are valuable in some of the cases. Others are greatly relieved by the regular use of crossote inhalations several times a day, with a nightly dose of antipyrin. The fumes of nitro and stramonium often afford on relief, and nametimes the cases are made distinctly worse by them. The heat of all measures is to send the child at once to a warm,

fly vlimate.

Very careful attention should be given to the diet; articles to be avoided with most authoratic children are cream, eggs, and all events. For all children who have had repeated attacks, whether in the form of tay fever or for times whose asthma is chiefly in the winter and spring and excited by attacks of bronchaits, the most important thing is removal to a place where they do not have the disease, and a residence there long complet to break up the tendency to recurrence. This will ascally require accord years. The region best suited to most asthmatics is one which is high, dry, and moderately warm. Some do exceedingly well at the mashors; others much better in the mountains. Patients often suffer ion in ritus than in the soundry,

Uniddren who are succeptible to the olor of animals should be kept from centact with them. Those who are sensitive to proteins of certain foods should have those eliminated from the diet after it has been determined which are the proteins responsible. Immunitation by the ingostion of very small quantities of the proteins has been practiced by Schlass and Talliet with marked success in some instances. The method is still in the experimental stage and should be employed with continue.

These children who are sensitive to pollen should spend the works in which the plants are in bloom in the mountains or at some place where they are not exposed. Distinct tenefit has been obtained by immunization against pollen in the lary fever and asthma of adults. It is as yet too early to say what the effect of this form of treatment will be with children. It should be attempted only by one trained in the methods of immunity.

CHAPTER IV

DISEASES OF THE LUNGS-(Continued)

PNEUMONIA.

In early life the lungs are more frequently the seat of organic disease, than any other organs in the body. Puramenta is very common as a primary disease, and ranks first as a complication of the various forms of a ute suffections disease of children. It is one of the largest factors in the mortality of infancy and childhood. Cases of acute pneumonia are divided, from an anatomical point of view, into two principal groups: (1) bronchopneumonia, also known as catarrhal and as lobular paramonia; (2) lobar pneumonia, also known as croupous and as florinous pneumonia. These differ little from each other in etiology, but considerably in the products of inflammation, the distribution of the disease in the lung, and somewhat as to the parts involved and the nature of the changes in them:



Pre. 46.—Bacoconstructuous. The picture shows at jus center one statio air reside, and at its margin parts of four or flow other resides; they are filled with large epithelial cells laving small marks. There are also seen beneather with intensely black randor and narrow protoplasm. Between the cells is a flustry general multiplied, which is the excellation fluid computated change the hardering process. The already appears are somewhat infiltrated.—From Karg and Schmool.

In broachoppeumonia the large broachi are the scat of a superficial inflammation, while in those of small size the entire broachial wall is affected; the exidation into the air vesteles is mainly cellular, being made up of epithelial cells, leucocytes, and red blood-cells (Fig. 46), fibria being either absent, or present only in small amount. In many cases there are marked changes both in the alreadar septa and in the intentitial rissus of the lung; goodstion is often imperfect, and there is a strong tendency for the inflammation to pass into a chronic form, involving the connective-tissue framework of the long. The lesion is widely and often irregularly distributed, usually being most marked in

the vicinity of the small brouch from which the inflammation agreeds, and in the most superficial lobules of the lung.

In labor presentate brought is, when present, is usually superficial, the walls of the brought being very slightly or not at all affected; the same is true of the absolar septa. The principal product of the inflammation is fibrin (Fig. 47), which fills the absoli and the terminal brouchi, the cells being relatively fow and chiefly beacocytes. The process is



Pat. 67.—Lunus Peterstoots. In the sir reside shows in the picture there is a five, alose paywork of Elein, in the mother of which are leacocytes. As the leavy port the established has contrasted away from the wall in reasoquence of the process of land-ening.—From Karg and Schmott.

usually sharply circumscribed, involving an entire lobe or a part of a lobe. In most cases it clears up rapidly and completely, there being but little tendency to involve the framework of the lung in a chronic process.

While in typical cases the two forms of inflammation are quite distined, there are seen many intermediate forms which partake of the characters of both, and one may be in doubt, even after a microscopical exammation, in which group to place a case. It not infrequently happens that both satistics of proximenia are present in different parts of the same long or in both longs at the same time. These mixed forms are especially frequent during the second and third years; but during the first year, and after the third, the types are usually well marked. The following table shows the relative frequency of lobar and been chopucumonia in three hundred and seventy cases, nearly all taken from one institution (New York Infant Asylum). They include all the cases of acute primary presuments occurring during seven years:

Under six rainths.	hrunchopsoumonis,	73	COURA	Solver :	mentionis,	11	choos.	
Sex to twelve * Second year,		260		*		22		
Third		19			130	21	1	
Fourth *		g		16		1		
Totale,		261	-	41	14	100	4	

Thus it will be seen that, of the cases of acute postumosis occurring during the first two years, twenty-five per cent were lobar and seventyfive per cent were bronchoppenments.

When we come to a consideration of the micro-regastems with which the different forms of purumonia are associated, we find that they do not correspond to the anatomical varieties. Lobar preumonia is regularly associated with the presence of the presumococcus, rarely with Friedlander's bacillus, but in a large number of cases other organisms are also found. In bronchopmeumonia there is almost always a mixed infection. In the primary cases the pneumosoccus is usually the predominant. organism, but it is commonly associated with the staphylococcus aureus. In the secondary cases, especially when province is follows usuales or scarlet fever, the streptococcus is usually present, such cases being generally of a severe type. In the pneumonia of dightheria, besides the streptococcus the diphtheria becillus is frequently found. In winter the burillus of influenza may be the only organism present, but it is usually associated with the pacomococcus. The organisms mentioned are found in all possible combinations, sometimes one and sometimes another predominating. With any of them the bucillus of tuberculesis may be found.

Much interest has recently been aroused in the different types of pneumococci which are found in acute pneumonia.² Of the cases studied thus far in young children, type or of Cole's classification, has been much the most frequently present; but all the forms found in adulta have been observed. In a series of 50 cases studied at the Babies' Hospital nearly 75 per cent were type iv.

"The division was been made according to the predominant clinical or pathological features. Most of the doubtful cases were closed as bronchopneumonia.

[&]quot;According to the remarkles of Cole of the Rockefeller Institute preparations may be divided into four groups or types. Not, it and in have definite individual classecteristics; is includes the remainder or unclassified group. The differentiation is made by animal inoculation and requires from twelve to twenty-four bours. For type 1 he has produced a serum from immunized horses

Some idea of the nature of the infection in premionia may be gained from the following table. The sputum cultures represent the passuracies of one winter and spring in the Bakirs' Hospital, and the post-mortem cultures from those of two sensors in the same institution:

	Special College Price 524 cases of processing.	Preferences culture long the Judge in TC race of garantia					
Staple/secrete autres	in 116 mass 2 94 m 4 63 h 7 67 h	31 (alone in 8) 26 (* * 4) 17 (* * 1) 19 (* * 2)					

Why the same exciting cause in one case produces bronchopnessionia and in another lobar procuments may be in part owing to the difference in the structure of the lung at the different ages, especially the relatively large size of the bronchi in infrarcy. Again, in very young and in feeble children, the process tends to become diffuse and the products are chiefly redular; in those who are other and more vigorous it is likely to be circumsembal, with filtern as its chief product; in the intermediate ages and intermediate conditions the types are often mingled.

The immediate source of infection of the lungs is the mouth or the rhinopharyax. All the forms of bacteria found in preumonia may be found in these cavities, some of them constantly, others only at certain times, especially during an attack of any of the acute infectious diseases. Provided the other conditions are favorable, preumonia may be excited by direct contagion. This plays a small part in inducing primary preumonia; there seems, however, to be little doubt that the secondary forms, especially the preumonia complicating measures, diphtheria and influence, are not infrequently communicated in this way.

which has been shown to have distinctly curative effects. Thus far no satisfactory serion for the other groups has been produced. As the serion is not effective in infectious due to other types that a, it is of fittle assurance in the pneutronias of young children since few of the cases of pacumonis at this age are due to this type of organism. The serion is not yet available for general use.

The pastmorrori of types r and n are relicen found except in the months of persons suffering from pretiments or those in scenarit with them. Type is the form which is most midely diffused and is frequently found in the months of healthy persons. The pastmonia associated with type is in adults a smally of the midder variety seen. The fact that this is the type of organism totally found in the pretiments of children probably accounts for the low mortality from primary pastmonias in patients over two years of age. In infants and young children, however, pastmonia associated with type is may be very severe.

The different forms of pneumonia which will be considered are: (1) Acute broachopneumonia; (2) arute lobar pneumonia; (3) acute pleuropneumonia; (4) hypostatic pneumonia; (5) chronic broachopneumonia.

Tuberculous bronchopneumonia will be discussed in the chapter

devoted to Tuberculous.

ACUTE BRONCHOPNEUMONIA

(Catarrhal Paccanomic; Labuler Panassonia; Capillary Branchitis)

This is essentially the preemonia of infancy. Under two years, the great majority of the cases of primary presidents are of this variety, and throughout childhood nearly all the cases of secondary pneumonia. The term brouchopneumonia describes a lesion rather than a disease, several quite distinct forms of infection being included under this head. Its mortality is high, because of the tender age of the patients in which the primary cases occur, and also because when secondary it complicates the most severe forms of the arute infectious diseases of children.

Etiology.—The distribution, according to age, of 426 cases of bronchopneaments was as follows;

During the first second thinks four first	hd year	 **************************************	 2012年31年	di	53 33 11 2 1	No 4	oral ·	-
			426	ī	00			

After four years broachopnessments is infrequent as a primary discase, although it is seen throughout shiblihood as a complication of the infectious diseases.

Of the cases referred to, 38 per cent occurred during the winter months, 31 per cent during the spring, 13 per cent during the summer, and 18 per cent during the autumn. While, therefore, accerty 70 per cent of the cases occurred in the cold months, broachopnermonin is seen throughout the year.

Broachopneamonia affects all classes, but is most frequent in children having poor hygienic surroundings, especially in immates of institutions, and in those previously debilitated by constitutional or local discase. In 246 consecutive cases of primary passumonia, 110 were in good condition prior to the attack, and 126 were delicate, rachitic, or syphilitic.

The following table gives a good idea of the conditions with which acute brenchoppeumonia is most frequently seen; 443 cases were classed as follows:

considery to	proachitis of the large tubes.	1
campleating	greatles	-3
	perturbation	
	diphtheria	
	ucute rigocolitis	
	mariet Sever	
	afterna	
	varioulla	
4	grysippins	

A large number of the patients had previously suffered from one or more attacks of broughttis, and fifteen previously had broughspacements.

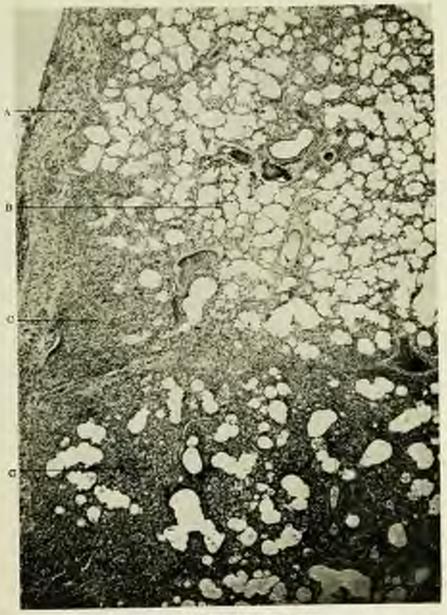
As an exciting cause, exposure to cold must still be classed among the potent factors of primary pneumonia. The organisms concerned in broachopneumonia have been discussed in the previous pages.

Lesions.—The term branchopnounces is now generally adopted as a generic one, and it is to be preferred either to lobular or entarrhal pneumonia, as it gives preminence to the branchial element in the inflammation. The process may begin in the larger tubes and gradually extend to those of smaller caliber, finally involving the pulmonary lobules in which these tubes terminate; or it may extend to the air vesicles which surround the tube in its course through the lung, so that in whatever direction the lung is out, there are seen, surrounding the small branchi, zeros of pneumonia (Fig. 48). In other cases the process seems to begin almost at the same time in the small branchi and the air vesicles, as both are found involved, even when death occurs within a few hours of the first symptoms.

There are, however, cases in which the parts of the lung affected bear no relation to the breachi—where there are found simply smaller or larger areas of pseumonia irregularly scattered through the lungnessally near the surface (Plate VIII). From the distribution of the lesions such cases might better be termed lobular than bronchopseumonia.

Much has been said in the past about pulmonary collapse from obstruction of the small breachi, as a condition unteredealt to this form of pulmonary inflammation. So far as our observations go, there has been addited but little evidence that this is the rule, or, indeed, that it often occurs. Even in autopoise made very early in the disease, but little collapse is found, most of the cases supporting the view of Delafield, that when the disease extends from the breachi to the air cells it involves those surrounding the tube quite as regularly as those to which the tube leads.

[&]quot;It is probable that a number of cases complicating influence were included among those primary cases.



ARRE BUCKSONAPMENT

Primary processions in a child two years old, showing the imagain distribution of the consolistation and its invariants exponents. A to the please somewhat thickness. B. long tissue which is practically somail; C C are consolisted invar, scattered through which are groups of the venicles call consisining sit. (Singhtly magnified.)



The following observations are made from a study of 170 autopsies of which we have records, microscopical examinations having been made in about one-third of the number.

Seal of the Disnote. In eighty-two per cent of the autopoies extensive

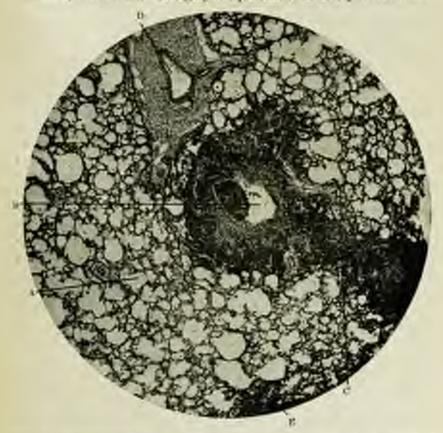


Fig. 48.—Benomerowerocott, with Thirespectual of a Binocome. In the center of the picture is used a small becombar, B, which is not converbed abliquely: the degree to which the wall, C, is thinkened is well shown. It is partially filled with past, its magnetic membrane is marriy destroyed, and its walls provide thinkened from infiltration with immuniciae. This infiltration extends to the long times in the picture the head tiefform a pero-bronchite same of parameters. Elementers in the picture the head tiefform, A, is prestically normal. D is a result blood-speed. It is provider smaller bronches. Throughout the long everywhere accompanying the small brunch similar changes were seen, in addition to which them were present some large seens of operacions. The discuss was of four and a half wreke' distation, the child, free mostle old.

disease was found in both lungs. The parts most affected were the lower lobes posteriorly; next to this the posterior part of both the upper and lower lobes. The left lower lobe was more extensively diseased than the

right in over two-thinds of the cases. If the pusumonin is in front only, the right apex > the most /request seat.

There are a certain number of cases which appear to follow tolerably well-defined stages of congestion, consolidation, and resolution; but the disease may be arrested at any of the stages and the child recover, or death may occur at any stage and there may be found at autopsy different portions of the lung representing all the stages mentioned. In considering, therefore, the lexious of bronchopneumonia, it seems best to describe the condition in which the lungs are found at the various periods when sleath is likely to occur, rather than to attempt to describe the different stages of the discuss, as in Islan pneumonia.

1. The Acute Congestive Form (Acute Red Presumanis).—This is the condition in which the lung is usually found if death occurs during the first two or three days of the disease. In the cases severe enough to cause death in the first twenty-four hours, very little can be seen by the naked eye except acute congestion. The wassle of the pleura are distended, and there may be small superficial hemorrhages. Both lower tooks are usually heavy and dark releved. There is to the naked eye no consolidation. All, or nearly all, the lung can be inflated. On section, there is found intense congestion with some edema. When the process has lasted a little longer the affected areas are more sharply defined. These, usually the posterior pertons of both lungs, are of a brownish-red color, and appear partially consolidated, although with a little force they may in most cases be inflated. After section, pas and mucus flow from the divided bronchi, and the whole lung may be more or less cangested or edemations.

The nicroscope alone reveals the fact that these are not cases of simple pulmonary congection or bronchitis of the finer tukes. In one case in which death occurred twelve hours from the first symptoms, well-nurked evidences of inflammation of the air vesicles were found. In these hyper-acute cases, the interescope shows great distention of all the small blood-courte of the affected arm, and small or large extravasations of blood just beneath the plants, into the altered and interstitial tissue of the large. In some mere these homorrhages form the most striking feature of the beson. The air vesicles are partially, some almost completely, filled with red blood-cells, seedlen and desquaranted epithelial rells, and a few learneyles (Fig. 16). The red blood-cells predominate. The inflammation may be diffuse, involving nearly a whole large, or in small area in the neighborhood of the small bronchi. The missian members of the large and small bronchi is the seat of catarrhal inflammation, and the walls of the latter are inflamed with round cells.

When the process has insted from brendy-four to forty-eight hours all the changes described are more marked, but the red color of the inflammatory products still persists. Such cases give during life only the signs of congestion and brombitis.

8. The Mottled, Red and Gray Pacamonia.—This is the usual appearance when the discuss has lasted semewhat longer, and is found in most of the cases dying between the fourth and fourteenth days. There are usually at this time quite large areas of considilation, sometimes affecting nearly as entire late, so that at first oght the case may resemble.

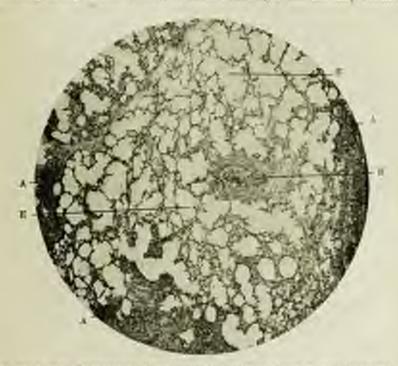


Fig. 42.—Acres Berocongrantmoons. In the renter is shown a small broadur, B. with a some of passimonic about it. The prenter pass of the arctice is unde up of supply-smartous lump tower, E.E. showing dilutation of the alcooler spaces and reprince of some of the aboving orpin. At the border, A.A.A. are somethe margins of consolidated areas of lump.

lober preumonia. This is satestimes described as the "pseudo-bolar" form. The extent of these areas depends largely apon the duration of the disease. In most cases there is plearity over the consolidated portions. This may cause the long to adhere to the cheef wall, the firmness of the adhesions depending upon the duration of the process. The surface of the long is usually of a muttled red and gray color; it often has a coursely granular feel, due to the consolidation of tonic of the superficial labelies of the long. On section, it is randy found that an entire lobe is consolidated, the superficial portion being most affected, while

the central part is normal or only congested. The color is mottled, like that of the surface. In some places the consolidation appears complets; in others the consolidated areas are separated by healthy, congested, or emphysematous lung tissus (Fig. 49). The gray areas surround the small brought and vary in size. The smallest ones look very much like



Fro. 50.—Recommendations. Dense infiltration of past ratio to and about a small branches; under a low power. The cavity shown in the specimen is a cross-serious of one of the small branch; which is postally filted with past ratio. The spithofoun is destroyed. The broad-land wall and the polinously times in the neighborhood set of densely infiltrated with bracopter that almost every trace of parently structure is effect. Child fifteen months old, discuss of four weeks' duration. Extensive sense like the were lound in both longer.

miliary tubercles. The larger ones are seen where the process has existed for a longer time and has gradually invaded the contiguous air cells. If the long is out parallel with the brought, there may be seen small gray strike of procumonia along their course (Fig. 48, C). From the est brought, pus flows quite freely on pressure. The broughtst walls are often seen to be thickened even by the naked eye. The parts affected

are usually the posterior portions of the lower lobe of one or both sides, the remainder of the lobes being congested or efematous, while in front the lung is simply-sematous.

Under the microscope the smaller broachi (Fig. 48) are seen to be much thickened and infiltrated with lencocytes. The gray areas surrounding the broachi are made up of groups of air voicles, which are packed with lencocytes (Fig. 50). Fibrin is sometimes seen in small amount, also red blood-cells and desquamated spithelial cells, left the lencocytes predominate. Surrounding the areas density infiltrated are groups of air vesicles which are normal or congested, or which show only the earlier stages of the inflammatory process.

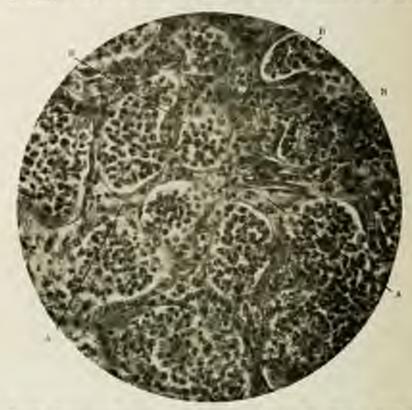
3. Gray Procumonia (Persisted Becautopycourous).—This form is seen in protracted cases when there have been continuous symptoms usually for from three to air weeks. The pleuritic adhesons are more general and firmer. The amount of long involved may be very great, after nearly the whole of both lungs posteriorly. The affected long appears completely consolidated and slightly enlarged. On section, it is of a nearly uniform gray color, sometimes of a sellowish-gray. On pressure, pas exades from the smaller and larger brenchi. The brenchial walls are markedly thickened, and in some places there may be a slight dilatation of the smaller branchi. The part of the long not consolidated may be almost white, owing to resimilar emphysems. In some cases there is also intensitial emphysems. Small cavities containing pas may be found in the long. The brenchial glands are frequently swellen to the size of a large bean, and are of a reddish-gray color.

The microscope shows that the sir venicles of the consultated portions are distended chiefly with leacucytes, but there are also epithelial and connective-tissue cells. The alveolar septa may be so much thickened as to enerouch upon the alveolar spaces (Fig. 51). Complete reso-

lution is then impossible.

Termination.—Death may occur at any stage, or the pathological process may be arrested at any stage and the case go on to recovery. Resolution may take place before any consolidation recognizable by physical signs has occurred; in such cases it is usually rapid and complete. If there has been consolidation, resolution may take place after two or three weeks and be complete, or it may be delayed for five or six weeks and still be complete. In many cases, especially those in which it is delayed, resolution is only partial, and there are relapses or recurring attacks. After the first, or after several attacks, there may develop a chronic interstitial passimonia; or simple passimonia may be followed by take-realesis. Such cases as these are to be carefully distinguished from the much more frequent ones in which the bronchopneumonia is tuberculous from the outset.

Associated Lesions of the Lungs. Pleasing is almost invariably found over every large man of consolidation, and in cases of more than three or from days' duration; while in most of those falsi within the first few days the pleasa is normal to only congested. It is seen in all grades of county, from a slight gray film of filtrin that can burdly be stripped off, to a validatish-green exhibition one-fourth of an inch-



Fac. 51.—Princeture Tourismontrements: Heavier Managers. There is shown if A A marked this bessing of the advector with conventing upon the abvolut spaces. All the abvolt B B, are densely packed with learneytes. A similar condition also through mostly the whole of the affected lang. (For history and temperature, we Fig. 60.)

thick. A small amount of scrum—two or three ourses—in the pictral ase is common, but a large scross offerior is very rare. Cases in which there is an excessive inflammation of the pictra are considered clarebers under the head of Pictropasamounts. Empyons accurs both during the stage of acute inflammation of the lung and while this is subsiding, but it is less frequent than in total programmia.

Brombiel Glands,-In all the recent acute cases these are avolled

and rest; the usual stay is that of a pea or a bean. They show microscopically the usual changes of acute hyperplasia. In protracted cases, and after reported attacks, they may be two or three times the som mentioned, and of a gray color. It is rare that they are large enough to give rise to symptoms unless they become the sext of tuberenfous abposits.

Emphysics.—This is one of the regular and striking features of soute benchequeumonia in sufancy, it being especially marked in the protracted cases. It is usually resicular, mealing the greater part of the upper lobes in front and the anterior margin of the lower lobes. Occasionally interstitial emphysics is seen, forming either large strike upon the surface of the lung, or bloks of rencolerable size along the anterior margin. This may secur even in cases uncomplicated by pertussis or by laryngeal stemosis.

Gangrene,—Gangrenous areas were found in six cases of the series mentioned. In four of these the promonia was primary, in one it followed diphtheria, and in one ilcoroline. It occurred in scattered areas of a grayab-green color, varying from one-fourth of an inch to two inches in diameter.

Absence of the funy are by no means uncommon. They were noted in seven per cont of the autopoies. They are usually minute and maltiple, varying in size from one-sixth to one-half inch in diameter. Sometimes a portion of a lole is fairly honogranded with minute elecesces. In one case a large abscess was found occupying the greater part of a labe, the symptoms resembling these of empressa. Abscesses are usually found in regions where the inflammatory process has been especially intense. Ther may be found in prolonged cases, in those of unusual severity, as shown by executedly high transmittane and rapid extension of the disease, and in very delicate subjects. The microscope shows that these absences usually begin as an asymmetation of mos in the recall bronchi, whose walls become softened and break down on account of the intensity of the inflammation. They may be superficial, but are more commonly in the interior of the long; they contain roller pas and sometimes broken-down lung tissue. Small abscesses can not be recognived elinically; the large ones give the symptoms and signs of empyens. They are discussed more fully elsewhere. In several instances they have been successfully operated on, though evough disgressicated.

The letions in other organs will be considered under Complications.

Symptoms - Bronchopmentermin has no typical starse. The cases differ from such other very markedly, but they may be divided into a few quite distinct groups.

L. THE ACUTE CONSESSIVE TYPE. This may be seen at any age, but is more frequent in young industs. It may be either primary or see-

ordary, being not uncommon in either form. Its symptoms are few and arregular, and the disease is often unrecognized. The entire duration may be only twenty-four hours. High temperature, extreme prestration, cyanosis, and rapid respiration may be the only symptoms. The temperature taries between 101° and 197° F., usually rising steadily until death occurs. The prostration is extreme from the outset, the patient being overwhelmed by the antidemess and severity of the attack. Cyanosis is frequently greent, and is almost always seen shortly before death. The respirations are from 60 to 80 a minute, but in most cases not strikingly labored. Gough is frequently absent. Corobral symptoms are often marked—diffuses and apathy, concetimes quite profound stapor, and not infrequently convulsions just before death. The physical signs are few and inconclusive. There is often melling almost always very rurb breathing over both lungs behind; sometimes the breathing on one side is feeble, and on the other much congruented. There may be no roles whatever, and no change in the percession note.

The sublentess and ascents of these symptoms are something which it is hard for one who has not observed them to appreciate. We have known as infant to die in twelve hours from the time in which he was apparently in perfect health, and had an opportunity to confirm the diagnosis of pneumenia by a microscopical examination of the lang. The diagnosis can not be positively made during life, and in most of the cases the disease passes under some other name. It is often regarded as malignant scarlet favor or measles with suppressed eruption, or cerebrospinal meningitis.

If the children are sufficiently strong to withstand the coset of elect symptoms, they may recover completely in four or five days, the lung clearing up very rapidly. In other cases these grave symptoms may aliate in a day or two, to be followed by those of sedimary broncho-pusumonia, which runs its usual course.

The symptoms of some of these cases may be explained by the sudden intense engagement of the lung, which, owing to the small size of the air vesicles, interferes with its function almost as much as does constidation. In other cases the symptoms are due not so much to the polmonary condition as to a general pseumococcus infection. We have seen cases of pseumonia fatal in less than two days in which the pseumococcus was found by post mortem cultures to be disseminated through the organs of the body.

2. Actual Dissemination Browningstrance (Capitaline Browning).—Although the symptoms in this class of cases are shielly due to the broughtits, there are always evidences of precumula to be found post merica. These are not very common cases. The process began as an inflammation of the medium-sized and small branchi, but not of

the finest brouch). The onset is neute, with fever, very rapid and labored breathing, severe cough, moderate prestration, and in most cases cyanissis.

The temperature is not high, usually only from 100° to 100° F., and it often continues so for three or four days. The pulse is rapid, and at first is full and strong. The respirations are exceedingly rapid, often from 80 to 100 a minute. There is dyspaca with marked recession of all the soft parts of the chest during inspiration. Cough is always present, socially severe, and sometimes almost incessant. The prostration is not so great as in the cases previously described, and the development of the symptoms is much less capid.

There are at first shilant and afterward subrepitant riles over the entire chest, with which are usually mingled coarser maist riles. There are no evidences of consolidation. The requiratory nursear is everywhere feeble, but not otherwise altered. Percussion generally gives exaggerated resonance, awing to the employeems which is present, the note being constitutes almost tympanitic.

The symptoms may gradually increase in severity until death takes place by the third or fourth day, from respiratory or cardiac failure. There is usually marked cyanosis, and toward the end rapidly increasing prostration. Just before death the temperature often rises rapidly to 106° or 107° F. At the autoper there are found evidences of broughitis of the intess of all sizes, and minute zones of pneumonia about the smaller broughi. The longs are generally in a state of hypersinflation, on account of which they do not collapse on opening the rhest. There may be in addition extensive congestion or oferms, the development of which has been the immediate sense of death.

In cases which do not prove fatal there is usually by the third or fourth day great improvement in the general symptoms; the fluor rides may disappear, and the course ones become more and more prominent. By the end of a week there may be complete recovery. Instead of this, there may be a continuance of the constitutional symptoms, and disappearance of the fine rides in front only, while behind there are gradually added to them the signs of consolidation in one of the lower lobes near the spine. From this time the case may progress at one of ordinary bronchopmenments.

The prognosis in this class of cases is very much better than in the congestive variety, recovery being probable unless the patients are very

young or delicate infants.

3. Bases energy works or the Common Tree.—When primary, this usually begins suddenly with symptoms not unlike those of lobar preumonia. This is the mode of onset in about two-thirds of the cases. In only about ten per cent is the preumonia preceded by branching of the

large tules. In these the symptoms of broadstis may slowly or rapidly marge into those of paramount. When the onset is adden it is marked by high fovor, frequently by counting, rarely by convulsions. In addition there are rapid respiration, rough, prostration, and cometimes symmets. The symptoms are more distinctly pulmonary than is generally the case in lober presentation.

The temperature, as a rule, is high; rarely is it continuously so, but it is of a consistent type. The dusty fluctuations often amount to four or five degrees. The fever nearly consumes from one to three weeks, and subsides gradually rather than by crisis, though crises are by no means rare. Although, as a rule, we expect a high temperature with acute passaments, this is not invariable. Primary cases may run their course, and even fermious facially, although the temperature has not been above 101° F. We have records of several suck cases. A low temperature is more often seen in young and delicate infants than in those who are often and more releast.

The respirations are frequent and behaved; there is real dyspers.

Sin inspiration, there are marked recosons of all the soft parts of the chest, and the shae nasi-dilate activaly. The usual rapidity of the respirations is from 60 to 80 per minute; very often, however, it rises to 100, and on several occasions we have seen it even 120. Respiration generally assuss more embarraced than does the action of the heart, and respiratory failure in a more frequent cause of death than cardine failure. The pulse is always rapid—from 150 to 200 a minute—and when so it is often irregular. The pulse rate is of much has importance than its character. Early the pulse is full and strong, but soon it becames soft, compressible, and work.

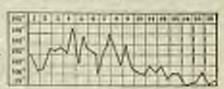
The prostration is usually moderate for the first flay or two, but steadily increases as the long becomes more and more involved, and toward the close of the disease may be extreme.

Goigh is much more constant than in lobar paraments, and more distressing consettings it is almost incoment. It disturbs rest and sleep, and may cause consisting if the purexy-measure scen after eating. There is no expectoration. Musics is sometimes coughed up into the tracker, or even into the planying, to be small-seed again, or more frequently aspirated into the long. If during a source purexy-m the patient is turned upon his face or inverted, much of this muons may be dislodged. A strong cough is a good symptom; suppression of the cough is a bad symptom, indicating a loss of the reflex sensibility of the broachial museus membrane and of the respiratory center.

Pain in the chest is not common, and is rarely an amonging symptom. Cyanosis is present at some time in most of the series cases. It may occur at the court, or ut may time during the course of the disease. It is usually due to endden congestion of a portion of the lung not previously involved. Even when slight, it is always a danger-signal of respiratory failure, and when present only in the fluger tips or lips indicates that the patient must be carefully watched and energetically treated. In the severe cases the whole body may be af a dull leaden bue.

Nervous symptoms at the caset are not so frequent as in lobar pneumonia, convulsions being rare; but late convulsions, particularly in the pneumonia which complicates pertussis, are frequent, and when present the disease is usually fatal. Determin may occur at any time during the

attack. In infants this shows itself by excitement and inability to recognize the nurse or mather. Occasionally patients present marked cerebral symptoms throughout the disease closely simulating those of meningitis. As obsewhere stated, the narrows symptons depend less upon the location of the disease than upon its extent, the intensity of the infortion, and upon the susceptibility of the patient, such symptoms



For 52.—Transmarium Cenen in Trystat.
Becommercurecona or rais Munara
Finnii. History.—Male, intern months
iid; deliente chiid; previous broadulis;
unset pradual; signs of consolidation at
left hase on fifth day, but fine raise over
toth lower inter behind; resolution slow,
rities penieting for a long time in both
huge.

being especially common in rachitic children and in those suffering from pertussis.

Gastro-enteric symptoms are frequent in infancy, and are of much importance. Often there are from four to six shods a day, of a green color, containing mucus and undigested food. Those symptoms depend upon the feeble digestion which is associated with the febrile process, and are often aggravated by improper feeding and commedication. Vomiting and diarrhea add much to the danger of the attack. In summer this complication is more frequent and is tikely to be more severe. Distention of the stomach or intestines from gas may be the cause of distressing symptoms, owing to the added embarrasement of respiration produced by this upward pressure. In infants it may lead to attacks of cyanosis and even to convelsions.

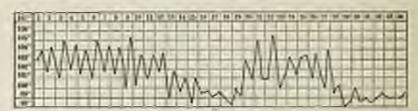
The blood in acute breachopacumonia shows regularly the changes of a moderate secondary assumia, which in protracted cases becomes very marked. A leucocytonia is almost invariable present. In an average case this ranges from 20,000 to 40,000. It semetimes is excessively high without any apparent reason. We have several times seen it over 100,000. The increase is chiefly in the polymorphonuclear cells which usually form from sixty to eighty-five per cent of the total leucocytes. With the fall in temperature the leacesytosis in most cases rapedly disappears. A rapid diminution in the leacesytosis may indicate a marked less of resistance in the patient; and may be seen with other a high or a low temperature. In the precurence which complicates pertussis, the increase in the white cells may be chiefly of the lymphocytes.



Fig. 51.—Temperations Cours of Basic more transacts with a Proposition Course, Recovery. Bridge, "Female, rightern results old; in fair condition; subdenganet, Early signs were localized, for this over left boss; as fifth for signs of non-solution at left boss, with ribes on both subs behind. General syngious of moderate sensity, Signs of susceichation disappeared about a work after counties of fiver; alles pemented nearly two works longer.

Positive blood cultures were obtained in 75 of 315 consecutive cases of bronchopneumonia studied at the Babies' Hospital. The preumococcus was found in 47, the streptococcus in 15 cases.

The urine in most cases is seamly, high-colored, and leaded with urates. A trace of albumin is often present when the temperature is



Fac. 5t.—Traincaverus Cours or Reasured Bacoconsprendings: Ricovery. Natura.—Male, mastern menths old; delicate. Consolidation on sight day is left lower lobe behind; two days later small area of consolidation in sight fower lobe behind; many ribes both adm; eight-could day, again of consolidation had disappeared. but many ribes periated. Accoming of fever on impressed, and twentieth days, accomposited by extension of disease as shown by new ribes, but an evaluation of consolidation during second atrack. Since resolution and convolutionare.

very high; but casts, renal epithelium, and a large amount of albumin are rare.

The temperature chart shown in Fig. 52 is a good example of a very frequent course of primary parametria of moderate severity terminating in recovery. In cases of this type the constitutional symptoms are not grave, and follow very closely the temperature curve.

The next chart (Fig. 53) illustrates a more severe but not uncomman routse of the disease in which the fever is prolonged. The usual duration of cases of this type is between three and four weeks. The irregular fluctuations of the temperature, rarely touching the normal line, are exceedingly characteristic of broachopneumonia.

The chart shown in Fig. 54 is that of relapsing pursumonia. The first attack was fairly typical, with about the usual duration. Resolution had began, and was apparently progressing favorably, when there was a return of the fever, accommunied by new signs in the chest, the second attack being aborter and milder than the first, Very often the temperature falls to normal without any signs of resolution, and after an interval varying from two to three days. to a week there is a recurrence of the fever and other constitutional symptoms, the second attack frequently proving fatal.

A frequent course in fatal cases is shown in Fig. 55. The duration of the discuss. instead of being five days as in this case, is aften only three or four. The temperature at first fluctuates widely, then rises gradpally until death.



-

March .

M.

OF RECOGNIFICATIONS, FA-TALL Millory. - Male, Wat months old; markedly chitic; suddon onest. Right fest day were fine tendet tillen throughout the thest, marked production, and examen; on third day, a small area of consolidation is toper lobe of left hug fehind; increasing prostration, epimonis, and death-Astopsy.-No pleuriey: corsolidation at left agen behind, and posterior two-thirds of left. lower labe; consolidation of right apex posteriosly, lower lobe intensely conguited.

Direction of the Ferer.-The following figures give the duration of the fever in 231 cases. The majority were primary; none were secuniary to dightheria, and only a few complicated mendes. Of the 169 cases that were fatal-

There died	let six days. seventh and twenty-first days.	25.0	PET.	cent.
	twenty-first and extieth days	19,5	*	
		100.0		

Of 78 cases which recovered, the duration of the fever was-

Less than seven days. From seven to trenty-one days. * twenty-one to nighty days.	21.9	
	100.0 - 1	1

Physical Signs. - In considering the signs of broachopnounouis, it is better to connect them with the different conditions in the lung than to group them in staces, as in latur parumonia.

- (a) Without Consolidation.-It can not too often be repeated that ternelopneumona may exist without signs of consolidation at any period during the course of the illicens. When the attack is primary, the earliest signs are due to congestion of the lung associated with broughitis of the fine tubes, which is usually localized, but which may be general. If the disease has followed broughitts of the large tubes, its signs are added. Congretion of the lung gives feeble breathing over the affected area and occasionally slight dulness or diminished resonance. With this are found course amorous, and finer sibilant riles, due to congestion and swilling of the muscus membrane of the larger and smaller brought respectively. These signs are seen replaced by very fine moist ribes, which are usually localized as one of the lower lobes behind (Fig. 56), These localized fine rilles are the first distinctive sign of broachopmenmonia. Som a change in the respiratory marmur is heard in the affected area, which becomes feelder to intensity and higher in puch. Elsewhere in the cheef there may be course tilles, due to broughitis of the large tubes. In such cases the areas of pneumonia are so small and so scuttered as to gree in themselves no additional signs, and the case may go on to recovery without presenting saything more distinctive than the signs montronged.
- (b) With Areas of Partial Canadidation,—In the lung at this time there are small areas of consolidation, generally superficial and separated to healthy or congested fobules. Percussion in these cases may give negative results or there is slight duliness. The recal fromities is not usually altered. The line most rides may be heard over quite a large area, but at some point, usually near the spine, over one of the lover lobes, they are sharper, londer, higher pitched, and more metallic, and seem close under the car (Fig. 57). Respiration is feebler here than elsewhere, and innecessionar in quality, approaching broughts breathing more and more as the consolidation increases. The resonance of the voice and cry is conggerated.
- (c) With dress of Consolidation Nove or Lew Complete.—On percussion there is dulness, but surprisingly little in comparison with the other signs of consolidation present. It is due to the fact that the consolidated portion, though extensive, does not involve the lung to any great depth, and also that there are in the consolidated area many alreadi which still contain air (Plate VIII). On palpation there is usually a slight increase in the vocal fremitus. On anscultation, there are still present the evidences of bronchitis, usually only behind, but conclines over the entire cheef. Coarse and fine rules are intermogled. Over the consolidated parts are heard bronchial breathing and immedial toics. At the renter of these areas the bronchial



Pao 36.—Form Peners: Course riles over both house; forchied fair (subsymptism) riles at the left base. No change in bouth sounds.



Pag. 57.—Service Stage. Course and few tibes over both longs behind: at left base an area of partial constitution, with broadwresiular breathing, exaggerated voice, and very sharp rilles.



Fro. 58.—Trans Street. A larger area of partial enomialistics, and in the center a small seen of complete consulidation with incombant hreathing sed voice and slight dalness. Signs over the right long median to what were previously present over the left.



Fig. 29.—Forum Stage. Extensive disease of both sides; large area of complete consolifiation on the left, with datases, beometrial breathing and voice, and no riles; surrounding this, inconductoral breathing, with many tiles. Signs in the right large shellar in these precusally present over the left.

Nors.—The large circles indicate course tiller, the small ones first riles; the red areas indicate consolidation partial or complete. The disease may stop at any one of these stages and resolution take place.

breatling is pure and rides are usually absent, but at the margin riles are present and the breathing approaches the bronchovesigniar type (Fig. 58). The signs of consolidation are rarely sharply circumscribed as they are in lobar pneumonia, but shade off gradually. The consolidated area is at first small, usually in one of the lower lobes near the spine, but may gradually extend until nearly the whole of one or even both lungs behind are more or less completely solidified (Fig. 59), The signs are found as far forward as the axillary line, but usually ston there. Friction sounds may be heard over the consolidated areas, but very rarely except where signs of complete consolidation are present. It is often impossible to obtain any idea of the condition of an infant's lung during quiet, superficial respiration. Sometimes over a part which is completely consolidated there is heard only very feelile breathing, or the lung may be almost silent. If, however, the child is made to cry per to take a deep inspiration, both the boundful breathing and rales are distinctly brought out. The intensity of the consolidation increases as the disease advances, and the signs become more and more like those of loter resuments. During resolution there is first a disappearance of the signs of consolidation, which may be quite rapid, but friction sounds and rules of all kinds often persist for three or four weeks longer.

The following statistics are of some interest, as showing the frequency with which signs of consolidation were found, and the day when they were discovered. Their value is increased by the fact that the children were under observation in an institution at the time they were taken sick, and that in all the fatal cases—thirty-six in number—in which signs of consolidation were absent, the diagnosis of pneumonia was confirmed by autopsy:

Consolidation noted on or before the fourth day	47 : 36 12 9 62	auce a
	166	

In general, it must be borne in mind that in many cases signs of consolidation are never present, as the areas of pneumonia are small and widely scattered; that where there is consolidation it is usually incomplete, because there are small areas of healthy long tisene between the begutined portions; that the signs of consolidation usually shade of gradually; and that both sides are almost invariably involved, although one side usually to a greater degree than the other. 4. The Propagation Form—Prestream Broad-regional Section 2.—
This is seen in primary cases, especially among delicate children, and in the preumonia complicating pertusses, influenza and measles, and is the form which often follows diphtheria. The coset and course of the disease for the first two or three weeks do not differ from an ordinary attack of moderate severity, but at the end of this period there is seen no tendency in the process to subside. The fever continues, although it may not be high, but by physical examination it is found that the areas of consolidation are gradually increasing day by day, until sometimes the greater part of both longs behind are involved. The air vesteles become so distended with cells that the signs of consolidation are more complete than in ordinary branchopneumonia. The physical signs present are

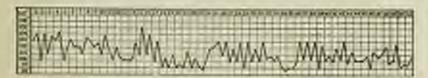


Fig. 50.—Theremoreuse Conve. or Paneserunt Basecquoreumouts, Transmative Fatasiav. History.—Mails ten and a half years old; healthy: sedden ones; for two weeks the only signs were very fine moist tills throughout both langs, front and back. The riller in front in givest past gradually closed up; those behind persisted, but it was not until the thirty-doursh day that positive signs of one-sidation were discovered in the left lower lebe behind, these signs gradually extended, and, before doursh, were present over nearly the whole left lang behind and twee the right lower labe. These were also friction sounds over both langs. Assigns,—Old and recent plearing with greeral albeman, left lower lobe completely rolet, patches of commissionism in left upper lobe. Hight lower lobe about one-half comoditated, with patches slewshere. Breachest glands large, but not closery. No evidence of tuberculosis upon either grass or mistroscopical examination (see Fig. 51).

marked dulness, sometimes almost flatness; there is brouchial breathing which is exaggerated in intensity until it resembles cavernous breathing, and it may be impossible to distinguish between them. However, the fact that it is heard over so large an area, that it shades off gradually, and that it is accompanied by friction sounds, usually make a distinction possible.

The temperature in these protracted cases for the first two or three weeks is from 100° to 103° P.; but after this time it is generally lower—from 100° to 102° or 103° F. The centre is not at all regular, but marked by frequent exacerhations and remissions. The general symptoms are those of progressive asthesia. There is continued wasting, anomia, and steadily increasing prostration. The appetite is lost, often there is an aversion to food, and comiting is easily switted if food or stimulants are forced. The shods show that even what food is taken is very imperfectly digested and assimilated. The skin becomes dry and loses its elasticity; bed-sores may form; fine punctate bemerrhages are

seen over the abdomen, sometimes over the chest and extremities. This condition is always a very had symptom, and recovery from posuments is very seldent some when it is present.

Death takes place from slow asthenia, usually after five or six weeks, but the attack may be prolonged for eight or ten weeks. The general symptoms, the temperature, and the wasting strongly suggest tuberculesis, and such is the diagnosis often made.

Although the majority of the cases in which the fever lasts over four weeks run the fatal course just described, such apparently hopoless cases recasionally recover. The temperature gradually falls lower and lower,



For \$1.—Transmarrow Crass on Execution of Street Bincomposurescons, Court.scarner Prorentes. Binkey.—Make als receive old; delicate; pertures for three works. Early signs of branchitle of large naises only; on the elected day signs of consolidation in right upper lake. Increasing processions, sylunosis, and death. Autopay.—Large areas of consolidation in right middle and upper lobes, small scattered spots throughout left lang.

until it remains at the normal point. For some time after this, often two or three weeks, little change can be seen either in the general symptoms or in the physical signs. Gradually the appetite returns, the thild is brighter and begins to take an interest in his surroundings, the cough abates, and little by little the signs in the lungs clear up. and the child may recover cam-Convalescence, however, is always alow, and may be interrupted by relapses, it being many months before

health is fully restored. Although the signs of consolidation disappear in a few weeks, rides are upt to persist for a much longer time. It is probable in such cases, even though all signs of disease disappear from the chest, that the long does not become normal. Belapses and second attucks are always possible and indeed frequently occur. The area involved in the relapse always includes that part of the long in which resolution was delapsed. The general health may be so undermined that the child never regains his former vigor; yet in a surprising number of these cases recovery accurs to be complete. Protracted cases of a mild type are sometimes seen, and, although the imperature pensists for a number of weeks, it is never high. The course of the disease suggests tuberculosis.

5. Secretary Perruous. —(a) Complicating Pertural.—It is not often that presuments develops during the first two weeks of this discuse. The most frequent time is from the third to the lifth week, when the patient has become enhanced from the previous severity of the pertural. In two-thirds of our cases the development of the permuonia.

was gradual, following branchitis of the larger tubes. The temperature chart shown in Fig. 61 well illustrates this course.

When the onset is sudden, the symptoms do not differ essentially from those of primary protonoms. The temperature of pertusus-portinomia is usually not high, in a very large number of cases not rising above 103.5° F., and ranging most of the time from 103° to 103° F. These cases are very apt to be prolonged, the fever often lasting for three or four, and semetimes even for six weeks. The physical signs of consultation may persist for a long time after the temperature has become normal, and set the child may recover entirely. We have seen one case in which recovery apparently complete occurred after the signs of consolidation had persisted for six months, and another in which they had persisted for over eight months. Very often the signs continue during the entire attack of pertussis. Cerebral symptoms are common, especially toward the class of the disease. Of fifty-four fatal cases, trenty-five had convulsions, and in twenty-two this was the mode of death. Only one case which developed convulsions recovered.

- (b) Complicating Member.—In a small number of cases the preumonia begins simultaneously with the investor of member, but generally not until the cruption appears. Instead of gradually falling to normal with the fading of the emption, the temperature continues high. Any of the clinical types of primary pneumonia may occur in measles, the scate congestive variety, which is fatal in two or three days, being especially common. In its course and duration the pneumonia of measles resembles the severe form of primary pneumonia. The bronchopneumonia of scarlet fever differs in no way from that of measles.
- (c) Complicating Diphtherin.—In many cases this does not give a distinct clinical picture of its own, its symptoms being mingled with those of diphtheratic broachitis, with which it is frequently associated. In others the forms resemble these seen in measles. The majority of cases occur as a complication of diphtheria of the laryax, although it is not infrequent in the asptic cases in which only the upper air passages are involved. Precumenta after laryagitis may develop within two days from the beginning of laryageal symptoms, and run a rapid course; or it may come as late as the second or third week. In a child warring an intulation take, the diagnosis of pacumonia presents difficulties, owing to the alteration in the respiratory sounds and the existence of the load tracked rilles which obscure the usual auscultatory signs. Although pneumonia may be apparent by symptoms, its situation may be difficult to determine. The most important signs for diagnosis are the diminuished regulatory marmor, localized riles, and dulness on percussion.

(d) Complicating Influence.—Without doubt many cases usually regarded as primary are really secondary to influence, particularly when

that disease is prevalent. While the preumonia of influenza may differ in no essential points from the primary form, there are types which are quite characteristic. In one variety the cases are of short duration, frequently lasting but three or four days, but with high and often widely fluctuating temperature, the general symptoms being of only moderate severity. A second type is a prolonged preumonia with exacerbations and remissions, which may last for two or three months with quite extraordinary fluctuations of temperature (Fig. 67). A third form a the recurrent type of pneumonia, of which a child may have several

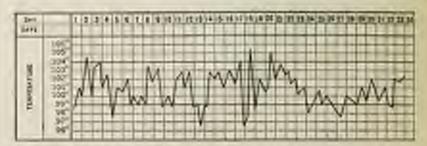


Fig. 62.—Excountryantements Computation Instruments: Death: Bishop.—Delicate infant, 7 months old, becombine and editio from works before. Acute come, carrie signs of consolidation in right long; double parameterise for otime on 18th day; small area of consolidation in left long on 19th day. Spetiant cultures repeatedly showed II. influence. Signs in large not much changed; death from exhaustion. Astopay.—Usual lemma of temperaturement of anothrate extent in both large. No other lesions of importance. Cultures from large showed the II. influence but no parameters.

distinct attacks in a single season, although in the interval neither signs nor symptoms entirely disappear. In a certain number of these cases a chronic form of passimonia ultimately develops.

(e) Complicating Hescolitia.—This is usually a somewhat subscate form of prezumania which is acarcely reorganizable except by the physical signs. It is seen in the protracted cases of also colitis and occurs late in its course. Very often preumonia is not suspected during life, the constitutional symptotes being sufficiently explained by the intestinal lesions, although the autopsy discloses the fact that death was due in part to pneumonia.

Complications.—Most of those relating to the large have been described with the boices. Pleurisy will be separately considered. Pulmonary emphysema is always present to a greater or less degree, but can not be made out by physical signs. In very rare instances subcutaneous emphysema has been seen. Abscess and gaugeene can seldent be recognized by physical signs. Pacumotherax occurs even in infancy, but is very infrequent except as a result of puncture of the class. Office is

exceedingly common, and one should be constantly on the lookout for it. It is recognized only by examination of the ear with a speculum.

Meningitis may complicate acute beenchopneumonia. It has occurred in about two per cont of our cases. It is in all respects similar to that occurring with lober pneumonia. Meningeal hemorrhage we have seen only once, and it was the cause of death in a patient eleven months old, who a few days before was seized with convulsions, followed by a gradually increasing stupor, which continued until death. The hemorrhage covered the entire convexity of the brain. Endocarditis is extremely rare; it was not observed in any of our cases. Acute pericarditis is also rare unless there is an extensive pleurisy. When it occurs it is: usually with pneumonia of the left side. Complications referable to the dipotive tract are quite common. Herpetic stematitis is frequent, and occasionally the ulcerative variety is seen. Thrush often occurs in the protracted cases among very young infants. Gastro-enteritie is not very common, considering the frequency of vomiting and diarrhes, these depending usually upon functional derangement. Nephritis is rare; it is usually of the acute axidative variety, and very seldom sovere enough to affect the programis.

Old Issions of Inherculosis-cheesy nodules in the lungs and sometimes in the plears-are not infrequently met with in patients dying of

senie preumonia of a non-tuberculous character.

Disgrasis.-An acute onset with continuous high fever, rapol respiration, and rough, should always lead one to suspect pacumonia. When to these symptoms are added prostration and a lencocytosis, the diagnosis of paramonia is almost certain. Cases of the scute congestive type are the ones most frequently unrecognized, and in many of these cases a positive diagnosis is impossible during lafe. Many stypical cases of presuments are seen, particularly in young infants. An unusual temperature course is perhaps the symptom most likely to lead to a mistake. While this, as a rule, is high and remittent, sometimes it is not so, and it may be but little above normal. Rapid respiration is almost always present, but rough may be very slight, especially in infants. In very young infants, the diagnosis often rests upon the prostration, cyanosis. and rapid respiration, the other acute inflammatory symptoms being absent. Only the physical signs of the disease can positively settle the question of diagnosis.

When pneumonia follows brouchitis of the large takes, whether the brenchitis is primary or complicates one of the infectious discusses, the extension of the disease to the lungs is usually marked by three symptoms—a steadily rising temperature, more frequent responstions, and inereming prostration. It may be taylve or twenty-four hours before the

At the outset, presentative can not be positively diagnosticated from severe branchitis. Such a branchetis often begins with severe promotury symptoms and a temperature of 100° or 100° F.; but this high temperature is of short duration, usually falling after twenty-four or forty-eight hours to 100° or 100° F. The prostration is much less and all the symptoms, possibly excepting the cough, less severe. The only physical signs are source riles, which are heard throughout the chest.

The same rules apply to broughttis of the smaller tubes. The riles are heard both to front and behind, and usually over both sides. If with such rilles the temperature continues to rise for three or four days in succession



Fig. 63.—Surveyer extraction. Indeed S. mentles olds, areas of excelledation in both teams, expensely marked at the left specs and the team of the right long. The only physical signs were mattered them.

above 103" F., it may by assumed that promreceils is present, precided there is no other discuss which might explans the temperature. If the signs of breachitis are limited to a sine gle Inng, or to one fang posteriorly, the raistence of broachogness menia may be regarded es certain, Localised bronchitis, then, is always to be interpreted as bronchemeumenta. provided behaviolatic can be excluded.

The differential di-

agnosis of bronchoparamonia from lobar pacumonia will be remidered in consertion with the latter disease. On account of the remittent temperature, bronchoparamonia may be confirmed with material fever; or materia may be suspected as a complication. An examination of the blood will remove the doubt.

Both the scate and the persistent forms of simple branchopsessments may be confounded with the tuberculous form; the points of distinction are considered in the chapter on Tuberculosis.

The X-ray is of value in detecting the presence of consolidation before this can be made out by physical signs. (See Fig. 63.) Small scattered areas of breas-hopesumonia rannot be differentiated from intervalues. Large areas of consolidation do not differ in their appearance from those of locar paramonia.

Prognosis.-Bronchopnemicatia is always a serious disease, and in an

refind dangerous to life. The prognosis depends upon the age, surroundings, and precious condition of the judient, upon the nature of the
infertion, whether the disease is primary or secondary, and, if the latter,
upon the character of the primary disease. In private practice the mortality from bronchopseumonia is from ten to twenty per cent, depending upon the conditions mentioned. One whose knowledge of bronchopueumonia is derived from observations in private practice can, however,
form but little idea of the frequency and severity of this disease in hospitals and asylums for infants and young children, particularly when it
occurs with epidemics of meades, diphtheria, or pertunsis. The statistics in the following table are taken from the records of two institutions,
and fairly represent the results seen in such places in children under
three years:

Farmed Personnia	Core	Double.	Marriage Marriage
Printry brondopteurona	194	190-	49.4
Following bronzvirin of the large types.	293	19	10.4
Secondary to measing,	59	90 19 36	63.3
T Declared	194 29 39 66	754	SLS
* * exariet fever	- 7	. 1	100.0
dipulieria	10.4	47	100.0
* Heorolitis	19	18	94.2
" epidemic influenza	6 2 2	1	36.6
* * Materials	2	2	100.0
* * eryspetas	2	2	300.0
Totals	901	780	15.5

The mortality varies with the age of the patient, being highest during the first year, and diminishing steedily thereafter, as shown by the following table giving the result in \$46 cases:

	Apr.	Chen	Manuality.
During the first year second year third fearth		2012 1922 133 6 0	86 35 36 16

In this table are imcluded no cases secondary to measles, scarlet fever, or diphthetia.

Probably the best of all guides to the nature and severity of the infaction is the temperature. An excessively high temperature negally indicates a severe type of infection. Some sites of this may be printed from these figures, giving the highest temperature and the mortality in two hundred and thirty-one cases, not including cases with measles or diphtheria:

Highest Yesspensters.	Care	Deaths	Percentage Mortality.
106" F. or over	55	47	85.5
105" or 106.5" F.	94	56	60.0
104" or 104.5" F.	53	26	49.0
102" to 101.5" F.	22	13	60.0
103 to 105.5" F.	7	5	71.0

The high mortality of the cases with unusually low temperature is due to the fact that they nearly aways were seen in infants with very feeble vitality. The outbook in cases with a stendily high temperature between 102.5° and 104° F.—is usually more favorable than in those with wide fluctuations, such as 100° to 105.5° F. As a rule, the danger from the disease increases stendily with every degree of temperature above 101.5° F.

An important factor in the prognosse is the previous condition of the patient. The association with rickets is unfavorable, both on account of the feeble muscular power of these children and their thoracic deformities. Marked and persistent tympanates is always an unfavorable symptom. As a rule, second attacks are more serious than the primary ones, especially if the interval between them is short.

In making the progresses in any given case, the symptoms to be considered are the height and course of the temperature, the presence or absence of nervous symptoms, the condition of the organs of digestion, the presence of symmetric and the extent of the disease as shown by the physical ages. We have not found the examination of the blood to aid greatly in prognosis. The leucocyte count various widely and often without apparent reason. Blood cultures, however, are of some assistance. In our hospital cases which gave positive blood cultures, the mortality was 70 per cent, while in those which gave negative cultures it was 44 per cent.

Convulsions occurring early in the disease do not affect the prognosis; but of thirty-seven cases in which convulsions occurred at a late period all but one proved fatal.

So long as the nutrition of the patient can be well maintained, as protracted case is hapeless, no matter how extensive the local discuss may be; but the existence of vomiting, diarrhea, or persistent tynpanites makes the issue doubtful, even though the other symptoms are favorable. Treatment.—The most important part of prophylaxis is to give careful and early attention to every attack of bronchitis in an infant, for every such attack should be regarded as a possible precursor of pneumonia. It is striking that one sees bronchopneumonia so seldom in private practice among the better classes, even though bronchitis is very frequent; while among hospital and dispensary patients, where bronthitis is very often neglected, bronchopneumonia is constantly seen. Cases of measles and diphatheria which are complicated by pneumonia should, if possible, be carefully isotated from others, and wards in which they are treated should be thoroughly disinfected before they are used for simple cases.

The hygicale treatment of bronchopnemionia is important, and usually it receives too little attention. It is much the same as that of cases of scate bronchitis already discussed. What was said in that connection regarding the recessity for fresh sir and the caution as to very cold sir, may be here repeated. The cold-air treatment is not admissible in very young or delicate infants, nor in cases of disceminated pneumonia (capillary bronchitis). The best results from this treatment are seen in the cases with extensive consolidation and with the minimum amount of bronchitis, and it is to be highly recommended in the pneumonia of the severe neuto infections—diphtheria, measles, and scarled fever. The dress and protection of the patient with the cold-air treatment are discussed under Lobar Pneumonia.

Older children with premuonia should be kept in hed. Infants for a considerable part of the time may be held in the nurse's arms. A frequent change of position in all cases is essential; no child should be allowed to lie for hours directly on the back. The general rules perviously laid down for feeding all sick children should be followed here. As a rule, medicine should not be administered in the food.

The same local treatment may be employed as in cases of bronchitis, Counter-irritation, best by means of the mustard pasts, may be employed from three to six times daily. It is of the greatest value in the early stage of scate polinomary congestion, and during attacks of cardiac or respiratory failure. Positions should not be used.

Alcohol may be needed in presuments secondary to diphtherts, meades, or scarlet fever, also in many primary cases. Its use has been greatly abused in this disease. Although there is little doubt that it is at times of much benefit, there is considerable doubt as to its mode of action. The dose is to be regulated by the condition of the patient. Not over one-half sence daily should be given to an infant of one year.

Of the circulatory stimulants, caffein, comphor, and digitalis may be used, and are recommended in the order named.

For a child of one year the following doses are suitable: Cuffein, gr.

¿ to gr. § every three boars; campber is especially valuable for quick effect; ¶ tij to v of a ten per cent colution in oil may be given hypodermically; digitalis, the fluid extract is generally to be preferred as more reliable than the tineture, ℚ § may be given every four hours. For immediate effect in sudden heart or respiratory failure, nothing compares with epinephrin given intrammentarly—doses ℚ ij to ℚ v of a I-1,000 solution; atropin, also used hypodermically, is sometimes nodel—dose, gr. γ½. Oxygen may be given continuously, but always mixed with atmospheric air. It sometimes seems to benefit greatly cases with marked cyanosis; often it does no good. Gentle fraction of the chest wall, without disturbing the patient, is sometimes useful in atmobiling the respiratory muscles, especially in protracted cases.

It should be remembered that the normal range of temperature in beoneloopusumous is from 101° to 104.5° F. This temperature is not in stack exhausting, and the chances of recovery are not impured by reducing it so long as it remains within these limits. Too much can not be said in condemnation of the practice of giving the culturproducts in full does for the reduction of temperature. In small does they are often useful to allay nervous irritability, restlement, and promote sloop.

Antipyretic measures are indicated in cases of hyperpyretia, which we may define as 185° F, or over, especially when extreme nervous symptoms exist. In these circumstances, the most certain, the most within our control, and honce the substantipyretic, is cold. It may be used by the evaporation both, the sold pack, spanging, cold compresses, or an ice-bag applied to the chest. (See chapter on General

Therapentics.)

Not all children lear cold well, and in its use and frequency of repotition one must be guided by its effect upon the child's general condition as well as upon the temperature. When with hyperpyrenia we have general symmetric, reld surface, feeble pulse, shallow respiration, and stupor, cold is contraindicated and a hot numetard both should be used.

Inhalations are of more value in relieving rough and in promoting broughful exception than any other means we possess. The same substances are to be used, and in the same way as mentioned in the article on Broughitis.

The nerrous symptoms,—restleaness, loss of sleep, etc.,—are often best controlled by cold or tepid sponging; in other cases by small does of phenacetin—i.e., one grain every three hours to a child of six mouths. Opium is to be avoided unless there is severe pain, which is very rare; or when the incommat cough is not relieved by inhalations. Codem may be given in slowe of gr. \(\frac{1}{2} \) every three or four hours to a child of one year, or morphin in half this does. Sudden attacks of general sellapse with cranesis are frequent in secure cases of hronchopseumonia. They may come on at any period in the disease. When occurring in the early stage, if promptly and energetically treated, recovery may take place, but when they some on in the late stages they are usually fatal. They may be due to scute congestion or edema of the lung not previously involved, or to circulatory failure. The most efficient treatment is the use of dry cups or the hot mustard bath, the administration of epinephrin and cuffein or campbor hypodermically, and to give oxygen continuously.

When the fever continues for five or aix weeks, with no disposition on the part of the disease to subside, one should continue the sustaining treatment adopted in the earlier part of the disease—careful feeding and judicious stimulation, but most of all should these patients be given the benefit of the fresh-air treatment. Some apparently hopelesscases recover; but, unfortunately, in the majority the continuance of the pneumonic process is in itself evalence of the weakened vitality of the patient, and, though he may live a long time, usually such attacks prove fatal.

When the fever has disappeared, and there is only a persistence of the physical signs and the general cashexia, the cases are more hopeful. Here, a change of air is more important than all other means of treatment. If in the winter or spring the child can be removed to a warm, dry climate where he can be kept in the open air, or, in the summer, he can be taken to the mountains, immediate improvement is often seen, followed by rapid recovery. With the change of air a general tonic plus of treatment should be followed, cod-liver oil, arienic, and iron being used, according to the indications in coch particular case.

One should never declare one of these cases of protracted pneumonia to be hopeless, nor should be too ready to assume that taborculosis is present because the child is wasted and anomic, and the physical signs have persisted.

No specific treatment of pneumonia has yet been proposed which can be recommended for general use.

CHAPTER V.

DISEASES OF THE LUNGS .- (Continued)

LOBAR PNEUMONIA

(Fibrings Paramania; Crospour Paramenia)

Etiology.—Age.—Lobar pneumonia may occur at any age. We have seen it in an infant of three mentils; but it is not until after the first year that it begins to be frequent. After the third year most of the cases of primary pneumonia are of this variety.

Of 500 cases the ages were as follows:

Ass.	Cases.	Peront
During the first year From the second to the sixth year " seconds to the eleventh year " twelfth to the fourteenth year	76 309 104 11	15 62 21 2
Totals.	500	590

Season. In 136 cases the seasonal occurrence was as follows:

Septem.	Claux	Pre-beat
In the three winter mouths spring sameer nortetan	45. 62. 6. 50.	25 46 4 15
Totals	116	106

Lebar pneumonia, in children therefore, as in adults, occurs most frequently during the spring months. March and April show the largest number of cases.

Previous Condition.—In our hospital cases, eighty-two per cent of the children were previously in good condition, and only eighteen per cent were delicate, ractitie, or sypholitic. This observation has been borne out by our experience in private practice, vin., that as a rule lober pneumonia affects children who were previously healthy. Or to state the matter differently, if a strong child contracts pneumonia it is nearly always of the lober variety. Previous Disease.—Previous attacks of pneumonia are observed in but a small proportion of cases. It was noted only five times in 160 cases, In the vast majority of cases lobar pneumonia is a primary disease, although it occasionally occurs as a complication of pertussis, measles, typhoid or searlest fover, and even diphtheria—cheefy, however, in children over three years old.

Epidemics of letter pneumonts we have never witnessed, although on several occasions we have seen two children in a family attacked either simultaneously or in rapid succession. Exhaustion, fatigue, and ex-

postre are to be ranked as associated exciting causes.

In addition to other causes, there is required for the production of the disease the presence and growth of the pacumococcus. Associated with it are often found the staphylococcus aureus and occasionally the bacillus of influence. The bacillus of Friedlander is very seldom the striting cause of preumonia in children. It was found but once in blood cultures of 87 cases in the Balees' Hospital.

Letiens.—The Sent of the Disease.—In 960 cases in children under fourteen years, this was as follows:

Seal of Directo.	Personal Cores	Collected Cone.	Trials
Right lung, upper lobe only	28 3 26 11	137 -4 142 94	176 12 168 77
Totals, right long	86	347	433
Left lung, upper lobe only. Nover more than one lobe	25 49 9	.68 214 29	93 267 38
Totals, left lang	81	311	394
Both lungs, upper lobes.	1 2	13 38 60	13 41 629
Totals, both lungs	12	111	123

The right lung was thus affected in \$5.5 per cent; the left lung in \$41.5 per cent; both lungs in 13 per cent. In the order of frequency, the disease involves, first, the left luse; second, the right apex; third, the right hase; fourth, the left apex. The disease affects, as a rule, a single lobe, and often only a circumscribed portion of a lobe.

The anatomical changes resemble those seen in the adult lung. There is an exudation into the alvedi and smaller brought of fibrin, scrum, lencorries, and red blood-cells (Fig. 47). There is usually in addition

an inflammation of the museus membrane of the larger brought and of the picura. The frequency and severity of the picurisy is a pseuliarity of the lesion in children.

In the first stage, that of congestion, the portion of lung involved is dark-colored, heavy, and edematons, and shows under the microscope a secons and cellular exudation into the air vesicles, with swelling of the epithelial cells lining the alycoli.

In the second stage, that of red kepatination, there is notally some exudation upon the pointainty pleans, generally a thin layer of their, giving it a dull look. The long itself is of a uniform dark-red misr. It is solid and cuts like liver. It looks as if it had been inflated to the atmost extent and then injected with a material which had solidified. The consolidated area is sharply defined. Under the microscope the air resides are sen to be distorded with an attudation which is chiefly fibra, but with some letcocytes, red blood-cells, and desquamated epithelial cells. The cells are chiefly knoweytes, and are usually more abundant than in the preumonia of adults.

In the third stage, that of year hepatication, the lung is more moist, and the inflammatory products are partly decolorized. This charge takes place irregularly throughout the lung, giving it a mottled appearance.

The fourth stage, that of resolution, follows gray hepatimation, and consists in the degeneration and liquefaction of the products of influemation, which are ultimately carried away by the lymphatics in great part, only a small amount being pushed out into the broachi and removed by coughing.

The duration of the stage of congestion is from a few hours to arrival days; that of the stage of red bepatination from two days to two or three weeks. This is the condition in which the lung is most aften seen at autopsy. The stage of gray hepatination is commonly shorter. Resolution usually begins when the temperature falls to normal, but occasionally it may be delayed for several days. It is generally complete in about a week.

Foriations in the Lesiana.—(1) Instead of clearing up at the usual time, the lung may remain consolidated for several weeks, and then resolve. (2) The stage of gray hopatization may be followed by a great exudation of pas cells, which may everywhere infiltrate the affected lung; or these may be circumscribed so as to form a single large aboves or many small ones. (5) There may be small areas of gargrans. All these three conditions are rare in young shildren. (4) There may be excessive pleurisy, or pleuropneumonia. This is found at autopsy in about one-half the cases, and will be separately considered elsewhere. The lessons in the other organs are for the need part due to the paramorescens. There may be pericardiate, especially with paramonia of the left side if complicated by excessive plearies. This is seen even in infants. The pericardial inflammation closely resembles that of the plears. There is a very abundant excelation of fibrin and pas, coating both surfaces of the pericardiam. Acute meningitis is rather rare. It is an acute purposest inflammation, with a very abundant excelation of grantish-yellow florin and pas, closely at the convexity. Less frequently peritonitis is present. Acute paralitis and acute arthritis are seen as rare complications of pasumonia. In most of the complicated cases the other lesions are second to those in the lungs; but they may begin simultaneously with, or even perceab, the pasumonia. In severe and rapidly fatal cases with meningeal or peritoneal complications, a general programsocorus septicemia as usually present.

The heart is generally found in diastols, with the cavities, especially those of the right side, distended with soft clots. There may be found ante-morten thrombi, which may extend into the pulmonary entery or the north.

Symptoms.—(1) The Typical Course.—A child three or four years of ago, after a few hours of elight indisposition, is unidically taken with teiniting, followed by a rapid rise in temperature. He is dell and heavy, complains of healache and general weakness, refuses field, and is easily persuaded to remain in bed. He has the appearance of being quite ill, even after a few hours. Occasionally shorp pain in the side is complained

of. The skin is dry; there are marked thirst, restless ess, and the other symptoms which accompany forer. The temperature is found to be 101° P., or even higher; the respirations 40 to 50 a asimute; the pulse full, strong, and 130 to 130. On the second day the patient is no letter. The temperature remains high; the tongue is coated; the america continues; the pain is more severe; cough is present and may be quite frequent.

After the second or third day the patient is usually more comfortable, and sleeps better, but may be disturbed by the cough. At times there is restlessness, and at night there may even be slight delireum. The respiration continues rapid and the temperature



Fig. 64.—Turptat. Transactures Creeks or Lenan Perrasona. History.—
Male, there yours ald: in Prince of the condition: section must; signs of consolidation—brushist empiration and mice, and delama—cur left lower tobe belief, not distinct until the morning of the fifth day. On the seventh day the long was resolving.

high. These general symptoms show very little change until the sixth or seventh day, when, after a long sleep, which has been more natural than before, the patient wakes, decidedly improved as to all his symptoms. There is less fever, and the temperature continues to fall rapidly until it touches the normal line, or it may even go below this. As the fever subsides the pulse drops to 30 or 100, and the respirations to 25 or 30 a minute. The appetite mon returns, and convalescence is smally rapid. In a week the putsent is out of bed, and in a week or two more he is out of doors. This is the course seen in fully two-thirds of all the cases of labor precumpois at this age.

- (2) Paramonia of Short Duration.—Instead of running the usual course of from five to eight days, cases are seen in which the duration is only three or four days, although the physical signs indicate that the process in the lung passes through the usual stages. These differ from the reducing type cheefly in their duration. They are always mild.
- (2) Abortire Presentation. This form of the disease is rarely seen in hospitals, but it is not infrequent in private practice where the physician is summened at the earliest signs of illness. The onset is proceeds like that of ordinary paramonia, and may even be as severe as the average case. The physical examination of the chest gives all the signs of the first stage of the disease, but on the second or third day the physician is greatly surprised to find that the temperature has fallen to normal, and that all the physical signs have disappeared. The process in such cases does not seem to go beyond the first stage of congestion; there is no evidence of hegutination of the lung. The course is often such as to lead the physician to the opinion that he has made a mistake in his Siagnosis. This type of preumonia corresponds with abortive types of other infectious diseases so frequently met with in children. The tenperature curve in such a case is shown in Fig. 67. The diagnoss of these cases is always attended with some uncertainty. There can be no doubt that many of the unexplained high temperatures of brief denotion which are seen in children are from this cause. Exactly why it is that the disease cometimes terminates in this way can not always be explained. It may be because the resistance of the patient is greater than usual, or the virulence of the pneumococcus is less,
- (4) The Professed Course.—Although usually lasting about a week, it is not rare for pneumonia to continue but, twelve, or even fifteen days. This prolonged course is usually due to the fact that the disease spreads from one part of the lung to another, or even to the opposite lung, involving in succession two, three, or more lobes. This is sometimes known as "crosping" pneumonia; it is always severe and the outlook is generally unfavorable. A prolonged temperature with physical signs limited to a single lobe should always suggest complications, most frequently empreous, occasionally pericarditis.

(5) Haperscule Paraments,—Preumonia may very rarely be fatal in the first forty-right bours. The onset is sudden, frequently with ourvalsions. The prostration is extreme and in a few hours the child may be pulseless. Delirium or deep come is the rule. There may be no cough and no symptoms or physical signs pointing to a pulmonary lesion. The respiration may be slow and very deep like the breathing in the air hunger of acidesis. The system seems overwhelmed by the intensity of the toxemia. Unless one has seen autopsies upon patients with this form of presumania it seems impossible to believe that the course could differ so from the type of disease usually observed. The diagnosis can only be suspected unless consolidation of the lung can be made out. This type of premisonia is not found in infancy. In a few such cases a complicating acidesis has been shown to be present by laboratory tests.

(6) Cerebral Paramonia.—This term was first applied by Rilliet and Barther to cases of previous in which the cerebral symptoms pre-

dominate. They will be considered later.

Oncel.—Professial symptoms of more than a few hours' duration are quite rare. The onset of lobar pneumonia is almost invariably abrupt, with well-marked symptoms—vomiting, diarrhea, chill, or consulsions. Vemiting is altogether the most frequently seen. In summer particularly, there may be vomiting and starrhea. A distinct chill is rare in a shild under five years of age, and is not very common even in older children. Convulsions are not very infrequent, being seen in about fice per cent of the cases. Their occurrence depends upon the suddenness of the invasion and the succeptability of the patient.

Cough.—This is present in most of the cases throughout the disease, but often is not marked for the first day or two. It is seldem a distensing symptom. A disposition to suppress the cough on account of

pain is very frequently noticed.

Expectoration.—This is rarely seen in early childhood, and practically never under five years of ago. Children of ten or twelve may have the same expectoration as adults—white and viscid, or brownish-red early in the disease, yellow and abundant toward its close. This shows the

presence of the pneumococcus in great numbers.

Pain,—Headache and general muscular pains in the back and extrematics are frequent during the invasion. The characteristic pain, however, is plearitie. It is not necessarily felt in the region of the affected lung, and often not in the chest at all. It is frequently referred to the loin, the epigastrium, or to any region to which the intercostal nerves are distributed. Pain in the right iliac fossa associated with extreme tendercess and some rigidity may lead to the suspicion of appendicitis when in reality the pain is referred from the inflamed picura.

Prestrution.—This is one of the characteristic features of pneumonia. The patient is generally willing to go to bed on the first day of the attack, and shows little desire to leave it while the disease continues. Ambulatory cases are not common in children.

Empiration.-This is always accelerated, and generally out of propor-



For the Lorde Personner were Reserved Tenrencyme. History. Fermic eighters mustbe old; in law resolution; sudden outer, repeated entangement the right fact, when there were very rade sepiration and elacht dalors at the right spea, in front, on the twelfth day at the signs of consuldation at the same point, no ribes four days after the crime the languages shour.

tion to the pulse. The normal ratio of the respiration to the pulse is one to four; in puenmenia, frequently one to two. The respiration is not labored and not quite panting, although this term is asmetimes used to describe st. Il is jerky. There is a short inspiration, then a mementary pause, followed by a quick expiration, which is accompanied by

a short mean. This expiratory mean is very characteristic. The rapidity of respiration is usually in proportion to the amount of lung involved, but it is also modified by the temperature, as the respirations often drop

from 60 to 30 in the counce of a few hours at the crisis.

Pales.—In the surly part of the disease this is frequent, full, and strong, from 120 to 150 a minute. Later it may be weak, small, compressible, and sometimes irregular. It is much more rapid in the child than in the abilit, 160 and 180 being often seen in cases not especially severe. The pulse rate is of Iso importance than its character.



For 66.—Lonax Pretracoria were Science—French reserves a arrest on Carea. States—French inheters menths old; faitly benithy; sudden convergence typical but physical signs driaged; convolidation in left manuscry region on the right day; on the moth in right long middle lobe; on the sleventh day a pseudoentical drop followed after twenty-four bours of apprecia by a farther rise, which was accompanied by signs of extension of the disease in the right lung. Smolution rapid after sinks.

Temperature.—The typical temperature curve of lobar pneumonia (Fig. 64) is characterized by an abrupt rise usually to 104° or 105° F_o and by daily fluctuations generally within the limits of two or three degrees until the crisis, at which time the temperature falls to normal. usually in the course of twenty-four hours. After this time it does not go above the normal line. Such a curve is seen in the majority of cases over three years of age.

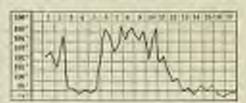
In children under three years of age it is not uncommon for the tem-

perature to be of a more or less remittent type (Fig. 65).

These wide fluctuations often lead to great difficulty in diagnosis, particularly if the physical signs appear late, as they not infrequently do. It is probable that most of them are to be explained as mixed infectious,

The chart shown in Fig. 56 illustrates three features which are often seen in postumonia: (1) A temperature which early in the

disease is steadily high and as the day of crisis approuches becomes remittent; (2) a secondary rise after being normal for twenty-four hours, which was due in this instance to an extension of the disease to a new part of the lung; (3) a fall to a point considerably below normal at the time of the rrisis. In this case the tenperature fell in the course of eighteen hours from 105° to 95" F., and later still lower; it was two days before it finally remained at the normal point, A fall to 76.5" or



Pag. 87.—decourses Programme by Lary Lorse, spanowers or Tryscan Programmes as Reserv Lorse, Tensor Tryscan Programmes as Reserv Lorse, Tensor Tryscan Programmes, as the second day discreminated from mast, on the second day discreminated from rises in both longs behind, and more left through lobe very firethe requiremen, high-prochedules, came broachitis, with competitor (7) of left hase. On the third togeth, and first days, general symptoms gase and signs reserved disappeared. On the stell day all approximated paramonia, and on the seventh distinct recordidation of right base, rest of chest stern. Subsequent recordidation programmes types.

95° F. at the time of crisis is not uncommon.

In the foregoing cases the fever terminated by crisis. In Fig. 67 is shown one ending by Irsis. This is a mode of termination much more frequent in young children than in these who are older. Thus, in 93 of our own cases, nearly all of which were in children under three years of age, the fever ended by crisis in 49, and by lysis in 44; while in 552 collected cases, the majority of which were in older children, 396 ended by crisis, and 176 by lysis.

The table on the following page shows the day of crisis in 567 cases of labar pneumenia in children who recovered. From this it will be seen that the most frequent critical day is the seventh, and that in sixty-six per cent of the cases it was from the fifth to the eighth day. The causes of a post-critical rise in the temperature are chiefly two—extension of the disease to a new area, or the development of plearisy, which is

apt to be paralest. Less frequently it is due to otitis, meningitis, pericarditis, or gastro-enteritis. In fatal cases the temperature is generally high until the end. In general, it may be said that the temperature a considerably higher in children than in adults; in the majority of cases it reaches 105° F., the usual range being from 102° to 105° F. In 15 of 137 cases, or cleven per cent, it reached 100° F, or over,

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Second day	3 cares.	Eleventh day	IS miles.
Third "	22 *	Twith ************************************	7 *
Fourth	43 -	Thitteenth	3.
Fifth -	88. *	Fourteenth *	7 4
South *	83 .	Fifteenth	I care:
Seventh "	132 *	Highteenth "	II came.
Eighth " commissions	73 ° 85 +	Twenty-first	A case.
Ninth	88. *	Townty-sixth *	1.4
Tench =	22 4		

Gestes enteric Symptoms.—These are more common in infants than in older children. At the onset there is frequently romiting, sometimes also diarrhes. A continuance of the vomiting is rare, and is generally due to improper feeding or medication. It may be a very serious complication. Diarrhea is also rare, except at the coact and in summer cases. Great tympanites is a distressing symptom, and when present, it is a bad prognostic sign. Throughout the disease there are ansteads, coated longue, and the usual symptoms of high fever.

Nerrous Symptoms.-Carebral symptoms are frequent and very often misleading. Preumonia is often ushered in by convulsions, which may be rejeated two or three times in the course of the first tweaty-loar bours. They are sometimes followed by drossiness or stupor, sometimes by active delirium. Ceretral symptoms may predominate for several days. There may be spirthologus, dilated or contracted pupils, irregular pulse, retracted abdomen, and, in fact, almost every symptom of mentsgitis. Lumbar puncture in these cases usually shows an excess of cerebrospinal fluid under high tension and it may contain a few pneumococt. Occasionally the decubitus on chien de fuell, or gun-hammer position, is assumed. These are aften described as cases of creetonl pseumonia and in many of them postmenia is not suspected until the fourth or afth day of the disease, sensetimes not until the crisis occurs, when the right disappearance of all these nervous symptoms indicates their origin. Early convulsions are not generally followed by an especially severe type of the disease, only one of seven such cases proving fatal. On the other hand, cases with late convulsions are usually fatal, as they indicate effort a very severe form of the disease or the development of a serious conplication, usually meningitis.

Delirium is much more frequent than convulsions, and is seen in

nearly one-fourth of the cases. Generally it is slight and noticed only at night or when the temperature is very high. It is most pronounced at the height of the disease. Other nervous symptoms belonging to the typhoid state are occasionally seen, but only in the most severe forms of the disease.

It is impossible to establish any relation between the sent of the disease in the lungs and the accurrence of cerebral symptoms. They are more frequent in children under free years than in those who are older, and depend upon the enddeaness of the invasion, the intensity of the infection, and the susceptibility of the child. Late in the disease they may indicate exhaustion, texemia, or complicating meningitis. The usual nervous symptoms—restlessness, headache, sleep-lessness, etc.—are nearly always proportionate to the height of the temperature.

Uring.—Throughout the febrile period of the disease the urine is scanty, high-colored, with a high specific gravity, usually loaded with urates and with marked diminution of the chlorids. A moderate acctone reaction is very common. In a small proportion of cases a trace of albumin may be found, and occasionally a few hyaline casts. Evidences of serious renal disease are soldon found in Johar pneumonia in early life.

Sain.—The face, in pneumonia, is usually flushed, sometimes on both sides and sometimes only on one; in other cases it is pule, but not indicative of pain. Cyanosis is rare except toward the close of the disease and is usually a sign of respiratory failure. Herpes of the lips or face is quite frequent.

Blood.—A marked polymorphomelear leucocytosis is a characteristic feature of lobur pneumonia; the exceptions are in very mild cases or very severe infections with little or no reaction. The increase begins shortly after the onset and continues during the stage of exudation, generally reaching its maximum shortly before the crisis, when it declines rapidly. The usual number of white cells in an average case of pneumonia in a vising child is from \$5,000 to 40,000, but it is not rare for the count to run up to 50,000 or even 60,000. We have seen it over 100,000 several times. The absence of leurocytosis in a strong child who is acutely ill is always strong presumptive evidence against pneumonia. A wellmarked leucocytosis is of much value in differentiating pasumonia from typheid fever. Positive blood cultures were abtained in the Bubses' Hospital in 14 per cent, of 108 cases studied. Otten found almost exactly the same proportion in a study of 70 cases. These observations indicate that positive cultures are much less frequent than in the pneumonia of adults.

Physical Signs.—The earliest signs in pneumonia are due to the



Pic. 65.—Peter States. Congestion of lide lower lebe, with crepitate riline. Fields breathing of a rule character, with slight didness.



Pai. 60.—In the motor of the area, a small spot of pure brunchial broading and voice; morrosisting this as occasional creptual rile, with broadbovesicular breathing and elight dislams.



For 70.—Serving Strack, Complete recordilation of left fewer labe. Pure broadcast terreling and broadcast robot; marked dutame: introduced usual frontiers, and at the lower part a few factors, module.

Norm.—During resolution the signs take the inverse order; those of Fig. 76 give place to those of Fig. 60, and those in turn to those of Fig. 68. In addition, many coacse place may be heard.

acute rengestion of the affected lung or labe, in consequence of which less air enters this portion and more air the rest of the lungs. Percussion gives dominished resonance or alight dollness, often of a somewhat tympanitic character over the affected area, and congressed resonance ever the remainder of this lung and over the opposite lung. Amoultation over the affected lobe gives feeble resperatory minimur, rather high in pitch; sometimes there may be so nearly an absence of all breath-sounds as to suggest find. The normal respiratory minimum over the healthy portions of the lungs is intensified. In children this exaggerated breathing is not infrequently mistaken for breachial breathing.



Pai. 71.—Lease Permanus. Clab! 2'd years: laved consent of part of night upper and middle lobes, at the height of the disease with all the treat eight of contribution.

and the physician may be led into the error of heating the positioning upon the wrong side. Exaggerated breathing differs little from normal breathing except to intensity. Breached breathing is higher in pitch, tubular in character, and is heard with nearly equal intensity both on expiration and inspiration. If the chest is frequently associated, crepitant or fine subcrepitant rides may usually be heard at some period at the end of full inspiration, but often they are present lest for a few hours, and they may be missed altogether. (Figs. 68, 69, 70.)

A study of cases of lobar pneumonin by the X-ray shows that consolidation occurs early, and that it first affects the surface of the lung, gradually extending inward as the disease progresses (Fig. 71). Beanchial breathing is not usually obtained until the consolidation has reached the hilms of the lung. Proble breathing and slight delices seem rardier. In the second stage, that of consolidation, no air enters the air testcles of the affected portion of the lung. There is found here exaggerated vocal fremitus, and marked dulness, but very rarely flatness. Over the rest of this lung there is exaggerated, sometimes even tympanitic resonance; this is superially frequent at the apex of the lung in front, when there is consolidation at the base behind. Under these conditions cracked-pot resonance may sometimes be obtained. Over the building lung there is exaggerated resonance. Over the consolidated portion there is broughful breathing and broughful robe, the area over which they are heard being sharply defined. Rides are usually absent, but there may be plearitic friction sounds.

In the stage of resolution there is a gradual disappearance of the signs of consolidation. The pure branchial is replaced by brenchesresicular breathing, the vesicular element gradually predominating. Moist rides of all turistics are heard. Usually the most persistent signs are slight dulness or diminished resonance, with a respiratory marmor which is feedler than normal and a little higher in pitch; sometimes there are also dry friction sounds. These signs may persist for two or three weeks.

Exceptional Physical Signs. - While in the majority of cases the signs of consolidation are distinct on or before the fourth day, in not a few they may be delayed much longer. Of eighty-two cases in which the flay was noted on which comodilation was found, it was not until the fifth day or later in one-fourth the number. In six of them, although carefully and repeatedly examined, no consolidation was found until the seventh day or later and in one case not until the twelfth day. These cases of delayed or concented physical signs have often been regarded as examples of central prosumonia. That pneumonia may exist only in the center of a lung for a number of days is extremely improbable. At autopsy we have very frequently seen superficial pneumonia but never central lotur posumenia. X-ray studies have shown conclusively that with a superficial consolidation no broughial breathing may be heard even though the consolidation may be fairly extensive. When the process extends toward and reaches the hilm of the lung broughtal breathing is readily board. It is the superficial posumonia, then, that escapes detection rather than the central. There are, however, two regions in which pursuitatia may exist and yet not be accessible by our means of physical examination, vir., at the apex of the lung in the part covered by the shoulder, and along the posterior horder of the lung where it lies against the verteleas. It is units sommon in cases with late physical signs that the first distinctive evidences of discuss are found high in the exilla, or beneath the clavicle in front, and these regions should be vissely watched in all doubtful cases.

Complications.—The occurrence of dry plearies over the consolidated portion of the lung is so constant that it can hardly be considered a complication. A slight serous saudation of two or three ounces is very common and often develops rapidly. In the most severe cases of pleurisy there is an excessive expetation of fibrin and pus. This has occurred in about eight per cent of our cases. This variety is known clinically as pleuropasumonia, and will be considered squarately. Pericarditis is mecommon. It is seen more eften in infants than in older shildren. It most frequently develops at the height of the pneumonia rather oftener when this affects the left lung than the right; it occurs in pleuropneumonia much more often than in the simple form. The pericarditis is usually of the fibruroparulent type. It may sometimes be discovered by physical signs; but rarely gives rise to any new symptoms. Endocarefitis is extremely rare, though now and then it occurs upon valves previously the seat of a chronic lesson. Meningitis is rare, and generally develops late in the disease. It is nearly always ushered in by repeated attacks of vomiting or convulsions. Its course is short and progressive, Peritonitis causes few new symptoms except abdominal distention, pain, and builderness. Parotitis and arthritis are very rare and are easily recognized.

Course and Termination.—In the great majority of cases tobar pacumonia terminates either in perfect recovery or in death. When ending in recovery, resolution commonly begins immediately upon the cessation of the fever, and is complete in about a week. Delayed resolution is not remnon in children; chronic posumonia and tuberculosis are rare sequelue, but empyens is very frequent. Its symptoms sometimes develop immediately after the pneumonia, the temperature continuing high; or there may be an interval of a few days before the development of the pleural symptoms. Some pleuritic adhesions probably remain in every case in which there has been much dry pleurisy, and when severe and extensive, these may be the cause of subsequent symptoms, like any other dry pleurisy.

Death from uncomplicated parameters may be due to exhaustion, or to circulatory failure, with or without failure of the respiration. The signs of circulatory failure sometimes develop quite rapidly in cases which are apparently doing well. The symptoms are: reldness of the hands and feet, then of the legs and arms; a rapid, compressible, and sometimes stregular pulse; muscular weakness and paller, but usually no cyanosis. The symptoms of respiratory failure are: very rapid superficial respirations, sometimes 160 a minute; blueness of the lips and finger nails; often a leaden has of the whole body; there are load trached riles, and recession of all the soft parts of the chest on insciration. Death may occur surly in the disease, when the presmonia has agreed rapidly, involving both lungs. In usest of the uncomplicated fatal cases, death results from failure of the circulation at about the end of the first week. In the complicated cases death usually occurs in the second week; but we have known fatal meningitis to develop as late as the end of the fourth week.

Diagnosis.—The most characteristic clinical and pathological differences between broncho- and lobar pracumonia are shown in the following table:

BROSOMOPKETSHINGS

- 1. Often woondary.
- 2 Under two, chiefly under one year.
- 3. Occurs more frequently in delicate and detallished children.
- 4 Bertena-in primary cases, usually the presupococcus; in secondary cases, usually careed infection.
- 5. Products of inflammation chiefly redular; process often diffuse,
- 6 Overt often gradual, constitues insidious, especially when secondary.
- 7. No typical course; fever after lasts three or four recks; sucely serminutes by crimic.
- S. Involves both lungs as a rule, teost impossity lower lobes posteriorly.
- Signs of bronchitis mingled with those of consolidation; riles in other parts of the same lung, or in the opposite lung, throughout the disease.

 Consolidation later—fourth to seventh day: there may be none; agit to be incomplete; shades off gradually.

- Resolution slow, one week to two months, often incomplete; strong tendency to become obsessio.
- 12 Reliques and second attacks frequent.
- Sequelar Empresa, chronic interstified purumonia, senetimes taberculosis.
- Prognosis always serious from the upe and the circumstances in which disease occurs.
- 15. Hospital mortality 50 per cent of princers cown, 65 per cent of all cases.

AGRAG PSTUMONTA

- I. Almost always primary.
- Most common between three and right years.
- 2. More often in those previously bouldly.
- 4. The presumptioners, very often
- 5. Chiefly Blein), process electroscribed.
- 6. Onest stalder, with well-marked symptoms.
- 7. Typical course; crisis, tunally from 55th to eighth day.
- S. Usually one loke or a part of a loke; left have must frequently, right upon next.
- Rales only early, and during molation; frequently no signs in opposite larg.
- Consideration earlier; second of third day. Consolidation complete; area tenally sharply defined.
- II. Resolution rapid, usually conplete within a week.
 - 12. Both are mre.
 - 13. No sequelae except empressa.
- Prognosis good; rarely fatal exorat from complications—empress, contragitie, pericardita.
- 15. Mortality about a per cent #

In the majority of cases the symptoms are plain and the physical signs or typical that it is difficult to overlook pneuments if any degree of care is used in the examination of the patient. The difficulties in diagnosis are due to the great variation in the general symptoms, and to the late appearance of the physical signs. The error usually made is to mistake pneumonia for some other disease, rather than to mistake some other disease for pneumonia. On account of its frequency in children, pneumonia should always be excluded before accepting any other explanation of a continuously high temperature. The rule should be followed, in all cases of scute illness, of making a thorough examination of the chest daily until the diagnosis is clear. If, to high temperature, rapid nopiration and marked lencorriceis are added, one should always ampect preumonia, no matter what the other symptoms may be. It not infrequently happens that the peneral symptoms are quite characteristic and yet the physical signs appear late. In such cases preumonia should always be looked for high in the axilla or just beneath the claviele, since it is particularly in the cases of apex pasumonia that this obscurity is likely to exist.

In their caset, scarlet fever, tonsillitis, and gastro-enteritis may all resemble premissin. Scarlet fever is recognized by the sore throat and the characteristic eruption on the accord day; tonsillitis, by the local symptoms. In infancy, pneumonia often begins with vomiting and sometimes there is also diarrhea, which may lead one to mistake the disease for gastro-enteritis. The constitutional symptoms of influence often closely resemble those of pneumonia; the diagnosis is frequently in doubt for several days until definite physical signs of pneumonia make their appearance. From all other general diseases, paramonia is to be differentiated by the physical signs.

Phenmonin with marked cerebral symptoms sometimes resembles cerebrospinal meningitis. In both we may have the abrupt onset, convulsions, delirium or stapor, opisthetomis, prostration, and marked leacocytosis. The only positive mains of differential diagnosis are by the physical signs in passanconia, and the findings from huntur paneture in cen-brospinal meningitis.

The question semetimes arises in pneumonia with cerebral symptoms, whether or not pneumococcus meaningitis also exists. If the nervous symptoms are persont from the beginning, there is probably no meaningitis. If they develop suddenly during the course or toward the close of the disease, meaningitis should be suspected. The only positive means of differentiation is by lumbar puncture.

Lobar passimonia is to be differentiated from a plearitic effusion. The most common mistake is to confound empyonia with naresolved postumonia. In presumenta marely if ever do the signs point to involve-

ment of an entire long. There is increased vocal fremitus, dulness, bronchial voice and breathing, and accasional ritles or friction sounds. In empyema the whole long is often affected, there is displacement of the heart, flatness on percussion, diminished or absent recal fremitus, and although breached voice and breathing are present, they are usually distant and feeble. There are no riles or friction sounds. In doubtful cases on exploratory puncture should always be made. Serom effusions give the same physical signs as empyema.

The X-ray may be of marked assistance in diagnosis. The shadow of consolidation in lobar paramenta is usually clear and sharply cir-

conscribed. It is aften wedge shaped as shown in Fig. 21.

Progresis.—There is probably no disease in which the patient appears so ill, and yet so often recovers completely, as lobar pushmonia in children over three years old. Of 1,295 collected cases, chiefly from hospital practice, there were but 39 deaths, a mortality of three per cent. In 187 cases of our own there were 21 deaths, a mortality of eleven per cent. In only one of the fatal cases was the child over two years ald. The difference between the mortality among our cases and the general mertality given, is due to the fact that a large proportion of the first group were observed in children under two years, while of the reflected cases, the tast majority were in elder children. Combining the above figures, we have a total of 1,082 cases with 50 deaths, a mortality of four per cent. In nearly all our cases death was due other to complications or to very extensive disease, as when both lungs were involved, or nearly the whole of one lung. In only one case was an uncomplicated pneumonia of a single lobe fatal.

The prognosic depends upon the age of the patient, the intensity of the infection, as shown by the temperature, nervous symptoms and pulse, the presence or alseme of complications, and the extent of the local disease. Those factors are to be taken into consideration rather than any special symptoms. Early conculsions do not materially affect the prognosis. Late convolutions are always very unfavorable.

The occurrence of vomoting, diarrhou, or marked tympanites late in the disease is always unfavorable.

A temperature range between 102" and 165" F. is the rule, and within these limits the fever does not affect the prognosis. Even very high temperature does not increase the danger from the disease as much as might be expected. Of fifteen cases in which the temperature reached 106° F. or over, all but three recovered; while of six cases in which it was 196.5" or over, only one died. The highest recorded temperature is our cases—197.5° F.—was in a patient who recovered. A transient rise, even though the temperature may go very high, is solden seriess. Much more serious is a fover which remains steadily above 106° F., 88

in most cases this accompanies either very extensive disease or pleatopurumenta. The continuance of the fever after the tenth day is a bad symptom; for, although the cross may be postponed until the twelfth day and occur normally, such a prolonged temperature is an indication of a new forms of disease or the development of complications. In a severe attack, the extension of the disease to another labe after the fifth day is unfavorable. If resolution does not begin soon after the temperature becomes normal, the development of empresma, or some other pulmonary complication, should be apprehended.

The results of blood cultures have some prognostic value. Of 108 hospital cases the mortality of 15 with positive cultures was 23 per cent;

of 93 with negative cultures it was but 8 per cent.

Treatment.—The specific treatment of labor pneumonia has not yet reached a point where it is to be advised with children. In considering the management of this disease several cardinal facts are to be kept in mind. It is a self-limited disease, having a strong tendency to recovery in the great majority of cases regardless of the treatment adopted. The fatal cases are almost always in children under two years of age; the rare deaths in older ones are usually due to complications. There is as yet no treatment which can be relied upon to abort an attack of pneumonia or shorten its course. It follows, therefore, that the indications are, so far as possible, to make the putient comfertable during his illness, to watch for complications, and to treat the individual symptoms as they arise.

In the majority of cases, hygienic treatment is all that is required. The patient should be kept in bed, no matter how mild the attack; he should be disturbed as lattle as possible. Most children with preumonia get too much treatment. There seems to be a decided advantage not only in fresh air, but in cold air. Patients in cold rooms sleep better, cough less, and altogether seem more comfortable than when carefully housed to prevent their "taking cold." Wide-open windows are desirable even though the room temperature is constantly as law as 50° F. The patient should be properly protected by blankets, flamed wrapper, woolen stockings, and at times a het-water bag at his feet. Food should be given at regular intervals, usually not offener than every four hours. It should not be forced when the patient is suffering only from thirst, especially early in the attack, when the appetite is often completely lost. Water should be allowed freely at all times.

These measures, careful nursing, an occasional dose of codein (gr. In to a child of three years) when the patient is very restless, fretful, or sleepless, an ice-cap to the bend, and cold specifying when the temperature makes him uncondectable, are usually all that is necessary, except to keep a sharp belocut for complications.

Special symptoms may require treatment. When not seture, the pervous symptoms may be controlled by codein alone or in combination with small doses of phenaretin or the bromids. Sometimes sponging with lepid water is better than drugs. Severe nervous symptoms, such as delirious, staper, great restlessness with impending convulsions, when associated with high temperature, call for ice to the head, cold energing, or the cold pack or bath. Pain, if moderate, may be relieved by counterirritation, by a mintard paste, by dry cups, an ice-bag, or by a hot pushtion; if severe, codein may be used in addition. The cough is rarely severe enough to require treatment. When it is so severe as to present sleep, small doses of Dover's powder or codein should be given. Antipyretic measures are not necessarily called for even if the temperature is very high. Some nervous children are less disturbed by the temperature than by the means need to reduce it. Under such conditions the temperature should be closely watched, but not necessarily interfered with unless other symptoms develop. The nervous symptoms are a letfor guide than the thermometer to the nee of antipyretics. Cold we beliene to be the safest and most certain antiprretis we possess. It may he used as a cold spouge bath, the cold park or an ice-bag to the chest. There is no objection to the both except the projudice of the laitr. While cold is applied to the trunk the extremities should be closely watched, and limit applied if necessary. The duration of the puck or bath, and the frequency of their use, will depend upon the individual case. In the majority of cases stimulants are not required. They are called for when the pulse is weak, compressible, and rapid, when the face is pule and the extremities are cold. The same stimulants are to be enployed, and in the same way, as in brombopurumonia. Circulators and respiratory stimulants are usually required in larger quantity at the time of and just after the crisis; they are to be used as in bronchopmeumonia.

PLEUROPNEUMONIA

Under this term are included cases of pneumonia with an excessive amount of plearisy, the two processes uniting to produce a single clinical type of disease.

In nearly all cases of lokar pneumonia there is a certain amount of inflammation of the pulmonary pleura, and also in those cases of broadspneumonia which are accompanied by any marked degree of consolidtion. In both of these conditions the pleurisy is usually co-extensive with the consolidation. But in certain cases, in both forms of pneumonia, the amount of pleurisy is excessive, and this so modifies the symptomand course of the discuss as to require for them a separate consideration. In some it appears that the inflammatory process begins almost simultaneously in the long and in the plants; while in others the plearier follows the postmonia. Those cases are almost invariably due to the pusumococcus, although in some there is a mixed infection.

In 398 hospital cases of pasamonia there were 27, or 6.8 per cent, which could be classed as pleuropaeumonia, the diagnosis being confirmed either by autopsy or operation. Of 190 fatal cases, 12.5 per cent were cases of [deuropaeumonia. Most of these begind patients were under three years of age, and the disease is more frequent at this period than in older children.

Lesions.—Of these 27 cases, 17 were classed as brouchopneumonia and 10 as lobar pacumonia. The left long was more frequently affected than the right in the proportion of three to two. In most of the cases the pleura covering the entire long was involved, even though the preumonia affected but a single lobe, or only a part of a lobe. In nearly half the cases both longs were involved, but one to a very much loss extent than the other. In a small number of cases the pleurisy was limited to the posterior surface of the lung.

In pleuropreuments both the visceral and the parietal pleura are coated with a layer of yellowish-green fibriu, in thick, shaggy masses, causing adhesions of the lung to the chest wall, the disphragm, and the pericardium (Plate IX). The sandation varies between one-eighth and one-half of an inch in thickness. It can often be stripped from the lung or straped from the chest wall by the handful. In its meshes small packets may form, which contain only a few drops, or sometimes a dram, of pus, or less frequently, serum. This is the condition in which the lung is usually found when death has occurred at the height of the disease. If the process has lasted longer, larger collections of pus may be present. The lung itself shows the usual changes of pneumonia, and if there has been any considerable accumulation of fluid, there are in addition the swideness of compression. The disproportion between the changes in the pleura and those in the lung may be striking. Frequently the polynomary lesions are relatively insignificant.

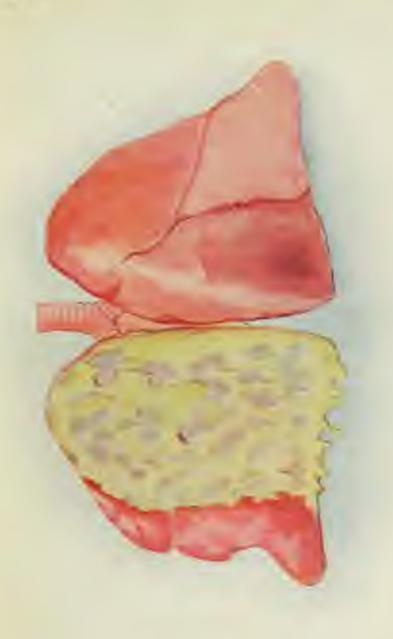
With pleuropseumonia of the left side, the pericardism is frequently involved. The lesions closely resemble those of the pleura. Meningities and peritonitis are by no means rare, and in most of the fatal cases a general preumococcus septicerois is present. The organisms may be found in the blood in great numbers during life or post mortem.

An inflammation of the intensity described is very often fatal in the neute stage, if the patient is a child under two years old. Occasionally at this age, and very frequently in older children, we see the later stages of the process. The most frequent course is for more and more pus to be poured out from the inflamed pleura until the closel is filled, the case becoming thus one of empyona. Sometimes the fluid is terous instead of purulent, but this is very rare in infancy. In other circumstances the exadation is partly absorbed, but the greater part becomes organized so as to form a thick jacket of fibrous tissue which bonds the loke or lung to the chest wall and interferes seriously with its subsequent full expansion. Chronic interstitial pneumonia may follow.

Symptoms.—There is little which distinguishes a case of pleuropusumonia except the severity of all the constitutional symptoms; the temperature is often higher, the prostration greater, and the patient in every way impresses one as being more seriously ill than with ordinary praumonia. Sometimes the theracic pain is more severe and more constant than is usual in pneumonia.

In the early stage pleuritic friction sounds are unusually preminext; after two or three days the signs of consolidation come out clearly in most cases, but still accompanied by load fraction sounds. After the fibriness saudation is very abundant, the signs are often obscure and confusing, and there may be at no time well-defined signs of consilidation. There is usually a mingling of the signs of consalidation with these of effusion. There is marked dulness, and sometimes flatness. The vocal fremitus is upt to be diminished, and it may be absent. Bronchial voice and breathing are heard, but they are not distinct as in concludation; ther are, however, feelile and distant, as over fluid. There are usually coarse, moist rales but these may be absent. The signs may be found over one entire long, or they may be limited to the posterior region. and even to a single lobe. They resemble these present over fail, with one exception-rin, the heart is not displaced. If an exploratory puncture is made, nothing is found; occasionally the exploring needle happens to strike one of the small pockets of pus in the meshes of the fhrin, and a few drops of pus are withleaven. If an incluou is made under the supposition that the case is one of empyems, no more pus may be found, the surgeon coming upon the filerinous masses as soon as the chest is opened. There is searcely any condition in the chest giving signs more puzzling than those just enumerated. They are, however, easily explained by the pathological condition.

Prognesis.—The prognesis in pleuropneausonia is much werse than in simple preausonia. In infants the outlook is very bad, the majority of the cases being fated during the acute stage. Very young children may be overwhelmed with the extent and the intensity of the inflammation, and die in four or five days. In children over two years old the most frequent result is for the case to go on to supposess, which with proper treatment usually terminates in recovery. Where there is organization of the fibrin with the production of extensive adhesions, the ultimate result often is not so favorable as when empressa develops. Convaisnoence is



Arres Permonerant

The high have been expected in heat and second out to show the whole cultural entities as seen hous tobind. The left hang, with the exception of a native strip about its motivar hooles, is completely covered with a third, regard conduction of their. The



usually alow, and the patients are liable to exacerbations of pleurisy; they may suffer for years from the partial crippling of one lung.

Treatment.—Cases of phenropneumonia are to be managed like the ordinary cases of presumonia of the severe type. In some, the excessive pain may call for more active counter-irritation and a freer use of opium than in other forms of presumonia, and the greater prostration may require that stimulants be given earlier and in larger quantities.

HYPOSTATIC PNEUMONIA

This can not often be recognized clinically, but it is very frequently seen upon the post-mortem table. It represents an inflammatory process of a low grade and a seen to some degree in almost every case where an infant has died of chronic disease. It is particularly frequest in those who have died of marassums. It invariably occupies a strip along the posterior border of both lungs, and usually of both the upper and lower lobes. This is from one to two inches wide, of a uniform dark red color, and is sharply outlined. The plears is not involved, and the remainder of the lung may be normal, congested, or slightly emphysematous. On section, it is seen that the pneumonic area is quite superficial, rarely involving the lung to a greater depth than half an inch. Under the microscope there is found a distention of the small blood-ressels in the affected area, and the air vesicles are filled with many red Mood cells, spithelial cells, and a few leacourtes. Between the areas of consolidation are groups of air vesicles which are normal, congested, or collapsed. It is a lobular rather than a brouchoppennonia. The lesions in this form of pneumonia are probably the result of venous stasis, owing to the child's recumbent position.

At autopsy the condition may be confounded with atelectasis. Iditle significance is to be attached to the finding of hypostatic paramonia at autopsy, and it alone should never be regarded as a sufficient cause of death, although it is perhaps the only lesson present. During life it may give rise to fine moist rides, which are board along the spine, usually upon both sides; but there is soldion either duliness or brouchial breathing. The treatment is that of the premary discover.

CHRONIC BRONCHOPNEUMONIA-CHRONIC INTERSTITIAL PNEUMONIA-BRONCHIECTASIS

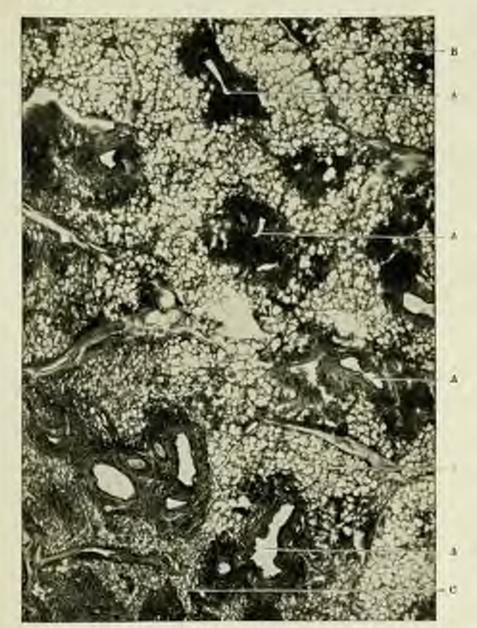
Chronic broackoppermoun is an inflammation of the connectivetissue framework of the lung, involving the stream, the alveolar septa, the walls of the broachs, and the plears. It is usually accompanied by cylindrical dilatation of the broachi-broachiectasis. Chronic presmenta may occur in the well naurished and apparently robust but in more common in the deficate. While seen at all ages its beginning is mainly before the fifth sear.

Etiology.—In stabline, as in adults, this process is most frequently associated with pulmonary tuberculosis; but in early life it is not an infrequent condition apart from inherculosis. The non-tuberculous cases, as a rule, are preceded by an attack of scate hymochognormania, serietimes by several such attacks, separated by longer or shorter intervals. Foreign bedies may cause localized interstitial preumonia of great severity. The organisms associated with shroote pneumonia may be the pacumocoscus or the staphylococcus, but more frequently we believe it is the influence becoilins either alone or in combination. It is hard to say why in one case complete resolution takes place in a discased ling and in another there follows a circuit progressive lesson. It is probably dependent upon a balance between the individual resistance and the agreeity of the inflecting organism.

Lesions.—The part of the lung affected may be an entire lobe, but neually it is a portion of one lobe, or there are areas in more than one lobe. There are dense connective-tissue adhesions hinding the diseased part to the cliest wall, to the displinger and to the pericardium, often so firmly that the lung is torn on removal. The affected lung is smaller than in health; it is hard, tough, and fibrous. Surrounding the fibrous portions are emphysematons areas. On section, the process is seen to be somewhat irregularly distributed through the lung, the lesion being usually most marked in the vicinity of the smaller brought, and sometimes even only there, the interesting long being nearly nernal (Flate S). In some portions, where the process is most advanced, almost all trace of long tissue may have disappeared, the part resembling a solid liberus tumor, through which run the locarbial tubes, usually much dilated. In places this dilatation may be sufficient to form cavities of considerable size. The beorehal glands are often enlarged to the size of a harelnut, and they may be tuberculeus.

Upon examination with the microscope, the plears is found greatly thickened, with hands of new fibrous tissue passing from it into the lung. The walls of the small brought are in most places thicker than normal, but elsewhere they have undergons cylindrical dilatation, and are filled with pus. The walls of the alreads show a marked proliferation of the connective tissue elements, and the alreads are filled with organized inflammatory products, so that they are nearly or quite obliterated. The stream is much increased in amount throughout the affected lung.

Symptoms.—In most cases there is a history of repeated attacks of a ste brouchsphotomonia, from which the child made a slow convaler-



CHROSE BROSEROSYRUSORIA

In the general part of the specimen, the discuss is the steel to the exemity of the small beautiful A A A each of which is successful by a some of two commerce them, the result of the inflammatory unuses the inverseling large issue, B B being ground. In the inverse but found position, the thomas is more diffuse. The six residues, C, between the arrange of new commentary times are greatly compressed, and in some phases entirely statement of new commentary times are greatly compressed, and in some phases entirely statement.

(After Delutabili)



terms to the pale, anemic, and sometimes wasted for several months. Improvement them took place in the general symptoms, the appetite and strength returned, and in many cases the lost weight was nearly or quite regained. However, neither the pulmonary symptoms nor the physical signs entirely disappeared. There remained a dry, hard cough, which at times was severe. Pains in the clost were occasionally complained of, and perhaps shortness of breath on exertion was noticed.

Examination phone a persistence of the duliness on percussion, with a rule or broughousicular responsiony murmur of very feeble intensity. Little change may take place in these signs for months; then an acute attack of brougholds or broughoporomonia may occur. If the latter, the same lung is affected, and a fresh consolidation is added to the previous disease. This attack may not be very severe, but it drags on for several weeks, with slight fever and little or no change in the physical signs. Partial resolution may then take place, but the lung is left much more seriously crippled than before. Often there is a history of several such attacks, each one leaving the lung a little worse than it found it.

The characteristic physical signs of chronic bronchoppromonia are not usually present until the process has continued for many months. They may be found over part of a labe, or over an entire labe, or even the greater part of one long. On inspection, there may be seen, in a wellmarked case, retraction of the chest, which is especially noticeable when the disease is situated at the apex of the lung. The oscal fremities is usually increased, but it may not be abnormal. There is marked dolness, often flatness, over the affected area, with suggested resonance over the rest of the long. The area of flatness shades off gradually. The most striking thing on auscultation is the very feeble respiratory murmur; in many cases the lung is almost silent. More rarely there is marked brouchial voice and breathing. Hilles and friction sounds are usually about except during an acute exacerbation of the symptoms, when they may be heard as in any attack of bronchopmenmonia. In recent cases there is no displacement of the heart; in these of long standing it may be drawn far to the affected side by contraction of the adbesions. There may be clabbing of the fingers in cases of long standing

When these lesions are once present complete recovery is impossible, and there is always a tendency for them to increase rapidly or slowly, according to the child's vigue of constitution, his surroundings, and the frequency with which exacertations occur. If the process is extensive the patient often succumbs to some intercurrent disease or to an acute attack of pneumonia; if limited in area, the process may be arrested and the patient recover, always, however, to be more or less embarrassed because of the crippling of a part of one lung. Not a small number of these children ultimately dise of tuberculosis, and in such cases it is al-

ways a difficult matter to decide whether tuberenlosis was present from the beginning, or whether it was due to subsequent infection.

The cases in which bronchisertasis is the most important condition are not common. The only characteristic additional symptom is a copious macoparalent expectoration, which is usually very fetal. It may amount to several ornies a day, and is expelled after puroxyens of coughing, which usually sever in the morning. This may continue for mouths, or even years, and get these patients are generally without fever, seldem loss weight, and may have the appearance of being in very good bealth. It is more that the physical signs of a casity are present.

Prognosis.—This depends on the extent of the disease, the patient's age and constitution, and on our ability to proceed by treatment, climatic and otherwise, the occurrence of acute exacerbations. Under the most favorable conditions, a few patients may recover completely so far as symptoms are concerned; but the majority remain at best delicate during childhood, or even throughout life.

Diagnosis.-The most important thing is to distinguish between the simple and the tuberculous cases, and this, by syneptoms and physical signs, is in the majority impossible. If the family history is good, if the nationt lives in the country, if his symptoms begin with a welldefined arute attack of passimonas, if the seat of disease is the base posteriorly, and if the examination of the spatian is negative for inlards bacilli the process is probable simple. If the family history is deputful or is positively tuberculous, if the patient lives in the city, and especially if he is an inmate of an institution or if his home is in the tenements, if the initial symptoms are indefinite, if the disease is situated anteriorly, the process is probably inferculous. The outaneous inhervalin test aids much in diagnosis. With a negative reaction taberculosis can be excluded almost with certainty; but a positive reaction does not prove that the pulmonary process is tuberculous, although it is strongly suggestive. The discovery of tabercle bacilli in the sputum is, of course, conelmiye.

Foreign bodies in the lung may give symptoms of chronic bronchopneumonia; metallic and many solid substances may be detected by the X-ray.

Treatment.—Nothing has any essential influence upon the discuss except change of climate. This should be the same as for inherculous cases. The treatment of the patient has for its object the maintenance of the general nutrition at its highest point, by careful feeding, judicious exercise, and by most of the measures enumerated in the shapter on Mahustrition. Cod-liver oil may often be given with advantage especially during the winter. The cough may be treated as in cases of chronic broughitis.

Cases of bronchisctness may obtain considerable relief from inhalations of crossots. Operation is not to be recommended.

ABSCESS OF THE LUNG

Multiple small absences are not uncommon as a termination of acute broachepneumonia, in which connection they have already been considtered. Larger non-tuberculous absences of the lung are rare, very obscure in their symptoms, and upt to be mistaken for localized empyema, sometimes for interstitial pneumonia with broachiectasis. Four such cases have come under our observation. One was discovered at antopsy, the other three were recognized during life and successfully treated by operation. Other examples in young children have been reported by Huber and by Hedges. The cause of these single abscases is usually a previous attack of acute primary prosumonia, less frequently an inflammation excited by a foreign body in the lung.

An abscoss due to a foreign body is usually accompanied by wasting. and a widely fluctuating temperature of a heetic type-symptoms suggestive of a rapidly advancing tuberculsus poscess. If the abscess follows an ordinary precurentia the course is generally less intense. The constitutional symptoms differ little from these of empyons. There is an irregular type of fever, sometimes quite high, but more often only from 99° to 101° or 102° F., a moderate rough, not much wasting, and generally not very marked prostration. A lencocrtosis of 30,000 to 50,000 is usually present. The physical signs are somewhat confusing and are a combination of those present in effusion and consolidation. There is an area of flatness shading aff into dulness. The vocal fremitus may be increased or it may be diminished. The respiratory murmur is very feeble or absent over the absesse, often it is bronchovesicular in character. Friction sounds and rides are usually present. The heart is alightly or not at all displaced. If an exploratory needle is introduced, pus may not be found even by repeated punctures; or it may be obtained at one time and not at another, although introduced in the same intercostal space, the difference in result being due to the direction in which the needle is passed into the long. When pas is found, the diagnosis of a localized empyonia is generally regarded as established, and it is not until the chest is opened that the mistake is discovered, The operator then comes upon the lung, which may or may not be adherent. If the absess fellows an acute premments the pre may show a pure culture of the pneumococcus. If it is due to a foreign holy, there is invariably a raixed infection, and the pas is apt to be fetid.

When not treated surgically, aboves of the long may rupture into

the plaural cavity, producing a secondary empyona, or apontaneous evacuation may take place through a bronchus and recovery follow. When the cause is a foreign body, rapid recovery often follows its expulsion by coughing. If the diagnosis is made and proper surgical treatment is instituted, recovery occurs in probably the majority of cases.

The general plan of treatment should be the same as in empyona. In a small proportion of cases aspiration may suffice for a cure. However, incision is usually necessary. If the plears is not adherent, adhesions should be excited by packing the thoracic wound with gause, and after a few days a second operation may be done. The lung should be opened with a blant instrument, following the line of the exploring needle, and a drainage-tube inserted as in empyona, the subsequent treatment being the same as for that disease.

GANGRENE OF THE LUNG

Pulmonary gangrene is care in children, although probably more common than in adults. It is most frequently associated with pneumonia. It is usually circumscribed, and seldom diagnosticated during life.

Etiology.—All but one of our cases have been in children under three years old, the youngest an infant of four rouths. Gangrene occurs for the most part in children who are ill-conditioned, feeble, or earhectic, and often follows one of the infectious discusses, particularly measles. Of twelve cases which have come under our personal observation, eight complicated acute besoehopneumonia. Pulmonary gangrene has been present in about three per cent of our autopsies upon cases of proumonia. The immediate cause of the necrotic process is interference with the circulation in a part of the lung, which is notally due to thromlessis or embelism of some of the branches of the pulmonary artery. To this there is added the entrance of putrefactive bacteria. In some cases pulmonary gangrene may begin as a septic thrombosis, this infection originating in some process in a distant part of the body.

Lesions.—The lower lobes are insee frequently affected than the upper, and the surface of the lung rather than the central portions.

Two forms of gargrene may be seen; the diffuse form, which affects a whole lobe, or even a whole lung; and the circumscribed form, which occurs in a number of small scattered areas. The latter is the variety usually seen in children. In the diffuse form the lung is of a dirty-green or brown color, moist, and emits a gangrenous odor. In the circumscribed form, when occurring in pneumonia, the parts affected are of a gray or green color, usually wedge-shaped, with the base at the

surface of the lung. In the early stage they are not softened, and have no gangrenous odor; later, both these conditions may be present, and masses of accrotic lung tissue may be found in a cavity with ragged walls, partly filled with fetid pus. Careful dissection will reveal, in many cases, the presence of thrombi in the sessels leading to the gangrenous parts.

Symptoms.—There are but two distinctive symptoms of pulmonary gangrene: the fetid odor of the breath, and the superturation of misses of necrotic lung tions. In the cases associated with acute puromonia, which include the majority of those seen, death nearly always takes piace before there is any separation of the sloughs, and even before very active decomposition in the necrotic areas has occurred. Both the poculiar symptoms are therefore wanting, and the diagnosis is made only at the autopsy. This has been true of nearly all the cases which have come under our observation. But these putients, with two exceptions, were infants. In older children, particularly in cases secondary to the entrance of a foreign body, the characteristic symptoms are more frequently seen, and there may be a third symptom—homorrhage. This is present in about one-fourth of the cases (Billiet and Barthez), and may be fatal. The general symptoms associated with gangrene are those of profound asthenia, resembling the typhoid condition.

From what has been said, it will be evident that the diagnosis is very difficult. If the characteristic odor of the breath is present, conditions in the mouth from which it might arise must be excluded. Cavity formation in tuberculosis may also be a cause of a very foul breath. The cutaneous tuberculin test will aid greatly in the diagnosis. The physical signs differ in no respect from those of ordinary cases of preumonia. The termination is almost always in death. This is due not only to the condition itself, but to the circumstances in which it is seen.

Treatment.—The general treatment should be supporting and stimulating, as in all severe cases of pneumonia. For the local process but little can be done, except the inhalation of antiseptics, of which crossote and turpentine are undoubtedly the best.

ACQUIRED ATELECTASIS-PULMONARY COLLAPSE

These terms are applied to a state of the long resembling the fetal condition, but occurring in a long which has once been expanded. It may be due to compression or to obstruction.

Collapse from Compression.—The principal cause of this form is plearitic effusion. It may also be produced by presumethorax, enlargement of the heart, pericardial effusion, deformities of the chest from rickets or Pett's disease, and tumous of the mediastinum or the thoracir wall. In these conditions, on account of the external pressure, the air testeles are not filled, although the broadil are pervious. After callapse but existed for a considerable time, changes may take place in the lung which render expansion difficult or impossible. Unless, however, there are pleavitic adhesions, expansion often takes place readily after many weeks or even months. The symptoms and signs are those of the original disease.

Treatment is available chiefly in that form which follows pleurities effusion, and will be considered in the observer on Empressa.

Collapse from Obstruction.—This is due to two factors: blocking of sither the large or small bronchial tubes, and feelds inspiratory force. The importance of collapse from obstruction in the acute diseases of the lang in infancy has undoubtedly been engigerated. Whenever a large or small bronchias is completely obstructed by a foreign body, the portion of the lang to which the bronches is distributed gradually becomes collapsed. If it is one of the primary bronchi which is occluded, a whole lang may be collapsed; if one of the lobar divisions, an entire labe; if one of the smaller divisions, only a small area. The collapse does not take place immediately, but the contents of the air swicles are gradually absorbed. The collapsed portion is slightly depressed below the surface of the lung. It is of a dark-red color, very vascular, and to the naked ope resembles a precumonic area, which it may subsequently become.

Many writers explain the development of boundsperiments from broachitis of the smaller tubes, through the intervention of pulmonary collapse, assuming that the obstruction of the small broach, from swelling of their walls and the accumulation of secretion, produces the same result as the plugging of a broachus by a foreign body. In our sen autopaies we have found little support for this theory. In acute broachitis of the smaller tubes the lumen is narrowed, but selfom crough to prevent the entrance of sir. The result is namely emphysems, not atelectasis. Such, at least, has been the condition we have most frequently found in autopoics in the carliest stage of broachopseumonis following broachitis of the fine tubes. There are very often groups of collapsed air vesicles surrounding paramonic areas, but these are neither an essential nor a very important part of the lesion. Collapse of a large part of the lung, or even of a lobe, we have never seen, either in perfussis or in acute broachities.

There is seen in delicate or rachitic infants a form of collapse which comes on very gradually. It is accompanied by hemselitic affecting the tubes in the dependent part of the lung. It may resemble the congenital form of and extentions. Under the microscope there is almost invariably found, accompanying the collapse, lebular pneumonia and bronchitts of the tubes in the affected regions.

The symptoms of acquired atelectasis are much the same as in the persistent congenital form. The respiration is rapid, and there may be impuratory dyspa as with deep recession of the clost walls, especially if there is rickets. There is also at times cyanous of variable intensity. The temperature is not elevated, but frequently is subnormal. The physical signs are very uncertain. There is usually fields respiratory murmur over the affected areas, scensionally accompanied by moist rales. The essential point of difference between these cases and those of congenital ability as it that in the former the patients are often strong at birth, crying and breathing well, giving no signs of anything wrong in the lungs until the general nutrition has suffered from some other cause.

The following is a fairly typical case: A female infant thirteen months old had been under observation for several months before death. During this period she suffered a great part of the time from mild bronchitis. The clost was extremely rachitic. The respiration was always accelerated, and on inspiration the lateral recession of the clost was at times extreme. There was occasionally seen slight cyanosis, and during the last few works it was constant. Death occurred quite suddenly. At autopsy there was found very marked resicular emphysema of both lungs in front. Nearly the whole of both lower lobes were in a condition of collapse, and of a uniform grayish-purple color. The posterior portion of the upper botes was similarly affected, but to a less degree. With moderate force all of the collapsed areas usuid be completely inflated. Bronchitis was present, but the picura was normal.

The treatment of these cases is the same as that suffined in the chapter upon Congenital Atelectasis.

EMPRYSEMA

Pulmonary emphysema consists primarily in overdistention of the air tesicles. It may result in their rupture and the escape of air into the interiobalar connective tissue of the lung. In infancy and childhood emphysema is usually associated with acute processes.

Etislogy.—Cases of emphysems are divided into two groups which are due to quite different causes. In one group it is compensatory, and consists in overdistention of the air vesicles in certain parts of the lungs because the full expansion of other parts is prevented either because they are consolidated, as in passurons or tuberculous, bound down by adhesions from old plearity, or subjected to external pressure, as from chest deformative due to Polit's illegam or rickets. In these conditions it is probable that the emphysems is produced during inspiration. It may also be produced by the artificial inflation of the lungs of the newly born.

In the second group of cases emphysema is produced by obstructive expiratory dyspace or cough. It is seen in all forms of laryageal elemons, in acute broachitis and leunchopmeumonia, in asthma, pertussis, and occasionally it is produced by any condition which requires deep inspiration and holding the breath. In branchitis the electraction may be caused by a swelling of the miscons membrane or by an accumulation of accretion. In this group of cases air enters the lung, but as it can not readily escape, the air vesicles are distensively sometimes to such a degree that their resolience is almost entirely lost.

Lesions.—The most common form in early life is neste vericular emphysema, which occurs when the force distending the air cells is only moderate. In this form there is dilatation of the vesicles with very slight structural changes, there being assally supture of a few alveslar septs only (Fig. 49). Although the dilatation may be quite marked, the emphysema is not permanent. The parts most affected are the upper labes, particularly the interior borders. In appearance the imphysematous lung is pale, sometimes almost white. The affected areas are prominent, and do not collapse upon opening the chest. With a lens, or even with the mixed eye, the individual air vesicles can often be distinguished as minute pearly testies, at times resembling military tubercles. When the discusse is accordary to note broughtts or larguaged stenous it may affect nearly the whole of both lungs.

With a greater distending force rupture of many of the air vesseles results, and this may give rise to interstitual or interlebular emphysium. At times likely are formed, varying in site from a pen's head to a cherry or even larger ones. These are usually seen at the anterior border or at the root of the lung on its inner surface. Again, the air finds its way between the lobules, dissecting them apart in all directions throughout the lung. Sometimes a large part of the surface of both lungs is seamed with irregular deep crevasses containing air, the largest being an inch or more in length and nearly one-fourth of an inch wide. The most severe cases occur in pertussis. On two or three occasions we have seen this form of emphysema, come to an extreme degree, when children had died from diseases unconnected with the respiratory tract, and when no history resuld be obtained which threw any light upon the etiology of the emphysema.

Localized emphysems not infrequently occurs in the subcutamous tissue of the thoracic wall following exploratory puncture of the class. This is seldom extensive and the air usually disappears in a few days by absorption without causing any symptoms. Sometimes from a rupture of an emphysemators weight at the hiles of the burg there occurs emphysema of the mediantinum which may spread to the tissues of the neck and ultimately to almost the entire body. The patient gives the impression of having been artificially inflated (Fig. 12). Such widespread

emplysems is usually associated with conditions which prove fatal, the emphysems adding much to the patient's discomfort but not increasing the danger of the original disease.

Symptoms-E mphyseam occurring in neutr pulminary diseases giverise to no peculiar samptems and to no physical signs except exaggirated resonance upon percuesion. This masks dulgess from consolidation and also that from the liver and spicen. If the patients receiver from the original disease, the emphysema greatly diminishes or disappears completely in the course of a few weeks or months. Acute interlabular.



Du. 72.—Hercian Structurations Entranses, Camp 11 Molecus that, Following perfecttion of a casesse molede at the root of the lang, pulmonary tabercolonic.

emphysema can not be disgnosticated during life, unless, as is sometimes the case, general subcutaneous emphysema is seen, which may some on quickly, last for several bours or days and then gradually disappear.

The treatment of emphysema is that of the disease with which it is associated.

CHAPTER VI

PLEURISY

At the common forms of inflavoration of the plears are seen in childhood. In the great majority of cases they are secondary to discuss of the lung itself. Serous effections are much less frequent than in adults, and under three years large ones are rare. Parallel effusion (empyona) is, however, much more often seen than in adult life, and it is the most important variety of pleurisy with which the physician has to deal.

Whether inflammation of the pleura ever occurs as a strictly primary disease is still a mooted point. Cases are occasionally observed clinically in which both the serous and purulent forms of the disease appear to be primary, but these are extremely rare. Acute pleurisy may, however, follow inflammation of the lung so rapidly that it is not easy to determine that the lung was first affected. In infants, extension from the lung is almost the sole cause. It occurs both with labar and bronchapneumonia, existing to some degree in nearly every case in which there is consolidation of the lung. Next in frequency to simple pneumonia as a cause of plenrisy are the fuberculous processes of the lung. Tuberculous plearing without tuberculosis of the lungs or the broachial glands is of doubtful occurrence. Acute pleurisy is an occasional complication of the infectious diseases, particularly searlet and typhoid fevers, measles, and influents. In most of these cases also it is secondary to discuss of the lung. Pleurisy in older children occasionally follows celd and exposure, although it is doubtful whether in any case this is the only cause. In them also it may occur as a complication of rheumatism.

The most important cause of acute pleurisy being extension from pneumonia, it follows that it is most frequent in the cold season, that it occurs more often in males than in females, and between the ages of one and five years. It may, however, he seen at all ages, and may even occur in intra-uterine life. The youngest case in which we have found entensive pleuritic adhesions as an avidence of previous inflammation was in an infant of three months. In this case firm connective tissue adhesions were found over the whole of both lungs.

DRY PLEURISY

In infants and young children this notally accompanies promotes or tuberculous processes in the lung. In older children it may be primary.

Lesions.—On account of the frequency with which this occurs in precuments we have an opportunity of observing it in all stages. In the mildest surjection it affects only the pulmonary pleans, and occurs over the pneumonic areas. The pleans is injected, has lost its luster, and appears dull or roughened. This is due to an excelation of fibrin upon its surface. If the process continues, more fibrin is poured out, and there are in addition swelling and a preliferation of the connective-tissue cells, and an exudation of leurocytes from the blood-vessels. The pleans is then coated with a layer of fibrin of variable thickness, in which are entangled pus cells and new connective-tissue cells. The layer of fibrin varies from the thickness of tissue paper to that of an cedinary book cover. In recent cases it may easily be stripped off, while in older ones it becomes organized and is firmly adherent. The color of the exudate varies with the number of pus cells. It is gray, grayish-yellow, or yellowish-green, according as these cells are few or numerous. As a rule dry pleurisy is localized, but the two opposing surfaces are affected. Part of the exudate is usually absorbed, but it is doubtful if complete recovery occurs, there being left behind some adhesions between the visceral and purietal layers.

In the dry form of twherculous pleurisy there may be only an exndation of fibrin, or the plears may be covered with gray tubercles and yellow fuberculous nodules. These are not only seen upon the surface of the pleurs, but develop in the exudation. In this form, which is usually chronic, great thickening of the pleura may take place. Both the serious and purishent effusions occurring in conjunction with tuberrules is are likely to be secculated because of the previous existence of

witherious

After nearly every case of dry plearisy there probably remains some slight thiskening of the plears. In certain cases there follows a chronic inflammation of the pleura with the production of new connective tissue, which results in thickening and adhesions which may be so extensive as to entirely obliterate the pleural cavity. Either one or both sides may be affected. It is usually accompanied by external pericarditis. This form is rare in childhood.

Symptoms.-As an independent clinical disease, acute dry pleurisy has no existence in infancy or early childhood. The cases which are occasionally so diagnosticated have in our experience invariably proved to be broachoppeamonia. In older children dry pleurisy may occur under the same conditions as in adults.

The symptoms are sharp, localized pain, increased by full inspiration, sometimes tenderness upon pressure, and a short, tensing cough. The rain is not always felt upon the affected side, and it may be referred to the abdomen. Upon physical examination, dry pleurisy is recognized by the presence of a pleuritic friction sound. This is usually of a dry rubbing character, generally localized, and heard both on inspiration and expiration. It is quite superficial, and not changed by coughing. This form of plenrisy, as a rule, runs a course of a few days or a week without constitutional symptoms. When dry pleurisy occurs as a complication of spermedia it is recognized by the signs fast mentioned; but it usually causes no new symptoms except pain.

Treatment. The treatment consists in counter-irritation by mus-

tard or india, according to the severity of the inflammation, and in the see of opens. Severe pain can constitutes be rehered by firmly entireling the closel with a broad band of adhesive plaster.

PLEURISY WITH SEROUS EFFUSION

This form of pleating is not common in young children, and in infants except with sente proumonia it is rare. In those somewhat older it is usually tuberculous in origin in which case it frequently acts like a primary discuse. It access as a complication of pneumonia and may be seen in neghritis, acute rheumatism, scarlet fener, or any of the other sente infectious discuses. Bacteria are occasionally present in the exarbition, even in cases which do not become puralent, but their number is usually small. The tubercle bacillus, the streptococus and the pneumococcus are the forms most often seen.

Lesisns.—The early changes are much the same as in dry plenray, but in addition serum is poured out from the blood-ressels, in some cases almost from the beginning of the inflammation. This may be small in amount, or it may fill the plental curity. The lesions are similar to those seen in adults, except that in children there is apt to be more fibrin. The process assually terminates in absorption of the serum, but, as in dry plenrisy, more or less extensive adlassions are left behind from the fibrinous explation. In other cases there is at first a clear serum, often containing presumences, then it becomes somewhat turbid, and finally parallent. This is especially common in infants,

Symptoms.-The very small serous effusions which occur so frequently as a complication of passimonia rarely cause new symptoms or a change in the physical signs. In the present connection only those cases will be discussed in which the amount of effusion is considerable. This form of pleurisy sometimes follows a well-defined attack of pagemonia. Other cases come on with acute febrile ayaptoms somewhat resembling those of pneumonia, but with all the symptoms less severe, except the pain. After an illness of only two or three days the chest may be found full of fluid. In a third group the disease comes on insidiously, with little or ne fever, and often with no distinct pulmonary symptoms except shortness of breath. There is general weakness, sometimes less of fesh, anemin, and moderate prostration; but usually the putients are not sick enough to go to led. The symptoms of plearest with effusion vary greatly. When it occurs as a complication of some acute infectious disease, it is often latent, and the diagnosis is to be made only by the physical examination of the chest.

In cases in which the fluid does not become parallent, the usual course

of the disease is for the fluid to disappear gradually by absorption, the case going on to spentaneous recovery. Serious symptoms resulting from pressure upon the heart and lungs are not common, but may occur when the fluid accumulates rapidly; hence they are most likely to be seen early in the attack. There may be great dyspaca, sometimes orthopoea, cyanosis, weak pulse, and even stracks of symoge. Death may occur with these symptoms. In certain cases there is seen no tendency to spontaneous absorption, and the studiation may remain stationary for months. There may then be force, usually slight but cometimes quite regular, with a decline in the peneral health, paller and attentia, which may strongly suggest the existence of pas, although this is not present. Others are regarded as cases of taberculasis.

Physical Signs.-The signs in the sheat are essentially the same whether the fluid is serious or purulent. On inspection, there is diminished movement of the affected side, semetines bulging of the intercestal spaces, and if the effusion is large, an increase in the necourement of the affected side of the chest. The apex heat of the heart will neually be considerably displaced if the effusion is upon the left side. It may be found at the epigastrium, at the right bender of the sternum, or even in the right mammary line. In discuse of the right side the displacement. is less, and occurs only with a large effusion. It may then be found in or near the left atiliary line. On palpation, the vocal fremitus is usually diminished ar absent, but it may be but little changed. Pervussion gives marked dalloes or flatness. In a large effection this is over the entire lung. There is also a sensation of increased resistance appreciable by the percussing larger. With a smaller effusion there is usually flatness over the lower part of the short and dulness or tympenitic resonance above; sometimes dailness is found behind and tympanitic resonance at the apex. in front. The line of flatness may change with the position of the patient. Grocco's sign is found in the majority of cases. This is a small triangular area of duluess posteriorly, with its base to the spine, on the side apposite to the effusion. The signs on anscultation are variable, and probably lead to more frequent mistakes in diagnosis than in any other pulmonary affection. Bronchial treathing and bronchial voice over the fluid are common in children. Atsurce of both voice and breathing is conclines met with, but it is exceptional. The broughtal breathing over fluid usually differs from that over consolidation, in that it is feeller and distant; in some cases, however, it is indistinguishable from that heard over consolidation. Friction sounds may be heard above the level of the finid, or when the finid is subsiding, and there may be bronchial eilles.

Diagnosis.—The most reliable signs for diagnosis are displacement of the heart, flatness on percussion, absence of rides and friction sounds, and (usually distant) bronchial breathing. In an infant, flatness should always lead one to suspect fluid. If there is flatness over one entire lung, the existence of fluid is almost certain. Between scrous and purulent effusions a positive diagnosis is possible only by the me of the exploring needle. This should be employed in every case, as it is important to know early whether or not we have a purulent effusion to deal with. The amount of fluid in scrous picurisy is generally less than in the purulent variety.

Plearney is further to be differentiated from pastmonia, and from tuberculosis. From precumonia, the acute cases are distinguished by the lower temperature, the less severe prostration, lower leurocyte rount and the fact that all the general symptoms are milder; but especially by the physical signs. The differential diagnosis by the physical signs between effusion and the various forms of consolidation is considered under the field of Empyema.

Prognosis.—In the scute cases complicating pneumonia, a secure plearisy is very upt to become purulent. Other forms of gleurisy with effusion, as a rule, terminate in recovery by absorption. In cases coming an without definite cause there should always exist a suspicion of tuberculosis, and hence every patient should be closely watched for the development of the other signs of that disease.

Treatment.—In the great majority of cases, only symptomatic treatment is required during the acute period. The patient should be kept in bed, and pain relieved by opium, counter-irritation, or dry caps. After the fever has ceased the patient may be allowed to sit up, but all exertion should be carefully avoided if the effusion is large. Sudden death has occurred when this rule has been violated. The patient should in suitable weather be kept in the open air as much as possible. In the course of a few weeks the effusion usually subsides under simple tonic treatment. Absorption may sometimes be hustened by counter-critation and diuretics; but convalescence is apt to be slow, and it may be several months before the health is entirely restored.

The removal of the fluid by operation is indicated in the acute form when it is accumulating so rapidly as to endanger life from the pressure upon the beart and lungs; also when there is no tendency to absorption after from two to three weeks of constitutional treatment. In each cases nothing is to be gained by waiting, and harm may be done to the lung by the delay. The usual method is by aspiration. In the acute stage enough should be removed to relieve the patient's symptoms, aspiration being repeated if necessary in twelve or twenty-four hours. In infants, particularly, there is great danger of wounding the lung when aspiration is repeated several times. This usually results in the production of pneumothorax which may mask the re-accumulation of the fluid. In

the subscute stage the removal of a portion of the fluid may be all that is required, spontaneous absorption of the remainder often taking place quite promptly.

ЕМРУЕМА

Fully nine-tenths of the cases of empyema in children under five years either occur with or follow pneumonia, being usually the sequel of the form described as pleuropneumonia. In some of these cases, however, the pleurisy masks the pneumonia, so that the former appears to be the primary disease. Tuberculosis is a rare cause in early childhood, but becomes more frequent after the seventh year. Empyema may complicate scarlet fever, measles, or any of the other acute infectious diseases. It is not with in premia from all causes. It may occur in the newly born as the result of infection through the umbilical wound or the skin. It is seen with suppurative inflammations of the joints and with esteemyelities. It may complicate suppurative processes in the abdones, such as appendicities or purulent peritonities. Among the local causes may be mentioned traumatism, necrosis of a rib, and the rupture into the pleural cavity of abscesses originating in the mediastinum, in the thoracic wall, or below the disphragm.

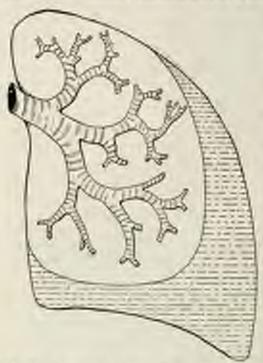
Since empyons is generally secondary to pneumonia, its causes are mainly those of that disease. Of ISO cases observed at the Eulers' Hospital in which the nature of the organism was determined it was as follows, 83 per cent of these patients being under two years of age:

Pricuraccoreus	115	-	61.0 per cent.
Streptococcus	26	-	14.4 "
Staphylococcus	34	-	7.8 "
B. Infraenage	1	-	0.5 "
B. Tuberculous	- 1	te.	0.5 "
Mixed infections	23	les.	12.8 "

Two-thirds of the mixed infections showed the purumococcus. The predominance of the male sex is even more striking than in pneumonia. Of 204 consecutive cases in the same institution the proportion of males was 68.6 per cent.

Lesions.—Empyenus is an inflammation with the production of serum, fibrin, and pus. In most of the cases—and the younger the child the more frequent its occurrence—it succeeds pleuropneumonia. There is first an explation of fibrin with an excess of pus cells. As the process continues, more and more pus is poured out, with serum. At first the fluid collects in small peckets formed by the slight adhesions. As it accumulates these are broken down, and the pleural cavity may be filled with pus. If the original inflammation involved but a portion of

the pleasa the empyons may be sacculated. This is often seen even in infants. Much has been written regarding inter-locar empress. This we have never seen either at autopsy or operation and we believe it to be a very rare condition in children. Localized empyons is, however, seen very often. It is usually posterior and over one lower tobe, but may be in any part of the chest. In very rare cases there may be several sacs containing pus, separated by septs. Such a condition we have



Fac 73.—Section of a Lines. To Hasteste the Setribution of the final in the close with a medicate effusion (Augramania).

never seen in empyerna following pneumonia The cases just described are those in which, in infants and young children, the pneamococcus is regularly found. The amount of fibrin is large. covers both surfaces of the pleurs, and many large reasses float in the fluid. The pers is usually thick, sreamy, and odorless. In another group of sunos the evidences of inflammation of the plours are much less marked, and in some they may be slight. There is but little fibrin in the exudate, and adhesions are rare. In this form the streptococous or the stardylococcus is the organism usually found. In these cases the inflata-

matice may be purefest from the outest, and the pas is thinner than in the preceding variety. Empyona following passumonia is occasionally preceded by a scrous effusion which, although almost clear, is mostly found to contain great numbers of bacteria, usually preumoresce.

Even when the fluid is moderate in quantity it is not all at the bottom of the cheet, but a generally distributed over a considerable part of its shirtace, and its depth at the middle and upper part of the elsest may be only half an inch. or even less. When the accumulation is larger, the long does not fluid on the surface of the fluid but the fluid surrounds the lung, which is compressed on all sides (Figs. 73, 74, 75). The

heart is displaced; the displacegm and the abdominal viscers are somewhat depressed, and there may be bulging of the cliest on the affected side. The amount of fluid in ordinary cases is from four to twenty ounces, although in neglected cases it may accumulate until it amounts

to four or five pints. The effect upon the lung will depend men the amount of fluid and the duration of the compression. When the quantity is small, or when the pressure is removed early, the lung in most cases readily expands, air being forced into it from the opposite lung. especially during the art of soughing. With the exception of adhesions, recovery may be complete. Although wide in extent. the adhesises are not mully strong enough to interfere senously with the function



To. 74.—Environ. Brian Stor. Monthers. Eryphoxy.

of the lung. If the pressure is great and has been long continued, the adhesions over the lung may become so dense and firm that expansion is difficult, and can at bot be only partial. In each cases recession of the chest wall occurs. In old cases expansion is still further interfered with

Pro. 25.—Empresa wrest Labor Epopulou.

by the rhanges taking place in the lung itself, annily a low grade of interstitial passuments.

In cases receiving no treatment, absorption of the pus is possible, but is not to be expected. It generally seeks an external outlet; the lung may be perforated and the pus be starnated through the brunchs, or external rupture may occur, generally in the neighborhood of the nipple. In still other cases the pus may harrow along the spane, or through the displangen reaching the perstoneum.

Empyrms is more often of the left than of the right side, the propertion being about three to two. It is double in about three per cent of all cases, but much oftener in infants. The most serious complication in young children is pericarditis, usually with empress of the left side; in older children a frequent complication is pulmonary tuberculosis.

Symptoms.—When it occurs as a sequel of pneumonis, the symptoms of empyoma may follow those of the original disease without any intermission; or after the temperature has been normal or nearly so for any

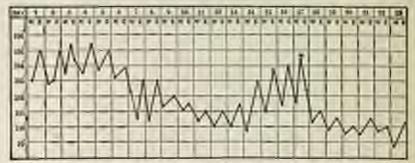


Fig. 28.—Emergina missioners: Proposed and Private patient, girl, eight years aid: average paramonia terminating by typic; development of empyonis indicated by monograpy temperature; operation on reventorable day proposery.

eral days it may rise again, sometimes quite suddenly, but more often gradually. With this accession of fever there are other symptoms pointing to an increase in the thoracic disease. (See Figs. 76 and 17.) After scarlet fever or other infectious diseases, the onset of empress is



Fig. 77.—Energies rosseries Perringes. Respital patient, two years old; single-lobe passenceia with reiss in teath day; in resolution, but includ gradual development of signs of empyona closely following the temperature curve.

often significant by cough, rapid breathing, and the other symptoms of assual. pulmonary disease. In the cases where empoverna appears to be primary, the onsec is acute, with high temperature and general and local symptoms resembling those of poeumonia. After each a beginning, the clast may be found full of

pus by the third or fourth day. In older children empyema may come on with gradual, and even insidious symptoms, there being only slight fever, dyspaes, and cachexia. Marked lencocytosis, 25,000 to 40,000, is almost invariably present. The proportion of polymorphomuclear cells is usually from seventy-five to eighty-five per cent. Of SS patients with empyone in the Babies' Hospital, nearly all under three years old, positive blood cultures were obtained in \$1 per cent. The passingsocrus was the organism usually found.

Whatever may have been the mode of smeet, when the pus has been in the clast for some time the symptoms are fairly uniform. During the acute stage there are present puller, memis, and prostration. respirations are always accelerated, being usually from forty to seventy a minute. Cough is present; there is dyspures, sometimes marked, but more often it is scarcely noticeable. The temperature is exceedingly variable; usually it ranges from 101° to 103° F. A typical heetic temperature with sessating is in our experience very rare. The pulse is rapid but of fair strength. There is loss of flesh, sometimes even emiciation and anorexia; occasionally there is diarrhea. The stage of noste symptoms may last from two to four weeks. This may be succeeded by a enhance stage which may last for months. In this there is little or no fever; the patient seems convalueent so far as regaining strength and color are conversed; but cough, dyspnea, and rapid respiration continue. The chest shows no change in signs from those of the scute stage. In chronic cases the general symptoms closely resemble those of tuberculools. There may be clubbing of the fingers, albuminutia, swelling of the fect, and often marked lateral curvature of the spine.

Diagnosis.—The physical signs do not differ assentially from those present in serous effusion. If there are signs of fluid in the chest and the patient is under three years of ago, the fluid is likely to be puralent; and from the third to the seventh year, pus is much more often found than serum. A marked learneytosis always makes pus more probable. In every case in which fluid is suspected the exploring needle should be used, because of the great importance of an early diagnosis. The skin should be surgically clean and the needle sterilized. Pas may not be found because the needle is too small, too short, or because it is introduced too far into the chest; for when the layer of pas is thin, the needle may be pushed through this into the lung.

The physical signs upon which most reliance is to be placed are, marked duliness or flatness on percussion, feeble breathing, and displacement of the heart. When in a young child these signs are present, whether general or localized, a needle should be inserted, and if pas is not found at the first trial, repeated punctures should be made until the presence or absence of fluid is definitely settled.

Empyema is most frequently confounded with unresolved pneumonia. The differential points are that in surveolved pneumonia the dulness is assully over a single lobe, riles or friction sounds are beard, and there is no displacement of the heart; empyema may give flatness over the whole lung, or over the lower half of the chest in front and behind, riles and

friction sounds are absent over this area, and the heart is nearly displaced. In both conditions we may get broughful breathing and voice. The confusion of acute promising or tubervulous with employers, generally arises from placing too much refunce upon aneultation. In pleuropacumous, with an executive exudation of librin, the signs may be identical with those of empyons, except that the heart is not displaced. We have several times seen pulmonary tuberculosis, with casestion of an entire lobe, which gave signs that were identical with those of a sacculated supposes. It is by the exploring modes, and by that above, that empyonia is positively differentiated from these pulmonary conditions.

There are some other thorariz discuss from which the diagrams may be even more difficult. A large pericardial offsion gives signs which are in some cases abentical with those of empyema of the left side. Marked displacement of the leart to the right is always a strong point in favor of empyema; besides, such pericardial affusions are extremely rare in young children. A pulmonary abscess of considerable size—also a rare condition—gives ugus identical with those of localized empyema, and is only distinguished from it by autopey or operation. Abscesses from broken-down tuberculters glands may give signs resembling those of localized empress, and like an empyema may point between the riso in the upper part of the chest. The constitutional symptoms of empyema may at times resemble typhost fever or mularia; but it is distinguished from them by the physical signs and by the examination of the blood.

Progressia.—The entrome of a case of empressa depends chiefly upon the age such general conditions of the patient, the exciting cause, the duration of the symptoms, the presence or absence of serious complications, and the treatment. The sucrtality in young children is high, particularly in the first year. 197 2014 consecutive cases admitted to the Babies' Hospital, the death rate was as follows:

First year	14	CERNET:	metality	74.	per.	cent
Second -	53.	.0	W	39.		
Over two years	37	н		13		- 11

It is often deflered to understand why the cases in infancy do so builty; many of these children on admission are in excellent condition and do well for a week or more after operation. Then the temperature rises, the patients lose ground rapidly and die of exhaustion during the third or fourth week. Their instelling to expand the compressed Imag properly seem an important factor, as this condition is almost invariable found at among. Very selform is there trouble with drainage. Em-

pyema in children over three years old seen reasonably early and receiving peoper freatment, almost invariably ferminales in recovery, unless the disease is double or serious complications exist. The best results are seen in the cases that fellow pneumonia. Preumococcus and staphylococcus rases have a better outlook than those due to the streptococcusor to mixed infections. Tuberculosis before the seventh year is an excoolingly infrequent cause, and gaugnene of the long and general pyemia are both rare causes in early life. It is those there conditions that make the prognosis of the disease in adults as serious. Great delay in operation makes the prognosis weres, because the more difficult the expansion of the long the more fedious is the disease, and the greater the likelihood of a sinus remaining. With proper early Insulment these putients god only recover, let in most cases the percenty is composingly compleir. Retraction of the chest and its resulting lateral enevature of the spine are rare, and seen only in neglected cases. In very many patients, in which a reasonably early operation was done, it is impossible, after the lapse of two or three years, to debut any difference wintever in the physical signs of the two sides of the chest. There are few serious diseases the treatment of which is more satisfactory than that of argic emprena in older children.

Spontaneous recovery in emporms may take place by absorption; but this is so care that it is not to be expected. The yes may be evacuated spontaneously through a brouchus, runture buying taken idace through the visceral plears. When this occurs, a large amount of pas may be coughed up in a few hours, usually followed by monodiate, but not always fasting, improvement. This is the most favorable of the natural terminations. External opening may take place, usually in the region of the niepde. There is an area of redness; then a fluctuating tunsor, and finally the pointing of an alsona. The discharge may continue for months, or even for years. External opening rarely occurs until the dissaw has lasted several months. Of 19 cases of emprena in children collected by Schmidt, in which a spontaneous discharge of pur occurred either externally or through a bronchus, there were 17 deaths and 2 recoveries. Empyons may harmer behind the disphragm into the alsdominal cavity, appearing as a joons abscess; it may burrow posteriorly into the lumbar region; it may rupture into the coplague, or through the disphragm into the peritonal carity. All these conditions, however, are very rare. The chances of spontaneous curs in supports are small. Of 32 cases, reported by Rilliet and Barthov, which received no surgical treatment, 21 proved fatel. The statistics of emptema before the general adoption of surgical treatment are appulling. Patients. were either ween out by the postructed supportation, or died from ameloid degeneration pneumonia, or tuberculous,

Treatment.—The medical treatment relates to the patient only; the disense is always to be treated surgically. Like any other acute absens, empressa requires free incision and drainage with proper asoptic precipations.

Assimtion as a means of cure is now seldom used. Unquestionably it sometimes suffices to cure supports, most frequently when it is localized, and when the cause is the staphylacoccus. How often this occurs is shown by the following statistics: Of 139 cases which we collected that were treated by aspiration, 25 were caped, 8 of these by a single aspiration; 13 dief, and the remaining 101 were afterward subjected to other treatment. The objections to aspiration are, that it is not possible to remove all the pue; that it affords no opportunity for the removal of the large fibrings masses; besides, there is the danger, ospecially with repeated aspirations, of puncturing the lung and producing paramotherax. Simple aspiration, therefore, is to be selvised in children only for temporary relief when the amount of fluid is large and the patient's condition such as to make it desirable to defer any more serious operation. It is to be advised also in the case of double emprema until sufficient adhesions have formed upon the first side operated upon to make opening of the other pienral cavity safe. Aspiration, followed by the injection of formalin and giveerin, is not, from our experience, to he recommended.

Incision and Drainage.—In most cases it is perfectable to delay incision until the period of most acute inflammation has subsided, as shown by lower temperature and stationary physical signs. This is usually seen two or three weeks after the pleural invasion. Such delay is not admissible if either the local condition or the temperature points to a steady increase in the disease; nor when the general sympisms indicate increasing prestration or sepsis. The dangers attendant upon general anosthesia are considerable, and in most cases it is better not to employ it. We have known of six deaths on the table during operation, and in several other cases have seen very alarming symptoms occur-Chloroform is more to be feared than ether. It is well, when possible, to employ local anosthesia. The most favorable point for incision is the posterior axillary line in the seconth intercedal space upon the right side, the eighth upon the left. In a case of localized emptema, the lowest point at which jets can be obtained by puncture should be chosen: The incision is made in the middle of the intercestal space. No matter what has been found by puncture on previous occasions, the exploring needle should always be used at the time of operation and at the site of the incision before the latter is made. The incision should be only large enough to allow the introduction of two tubes side by side into the pleural cavity. The hemorrhage is very rarely sufficient to require a

ligature. It is undesirable to attempt to empty the chest at the time of operation. A better plan is to insert the tubes at once and apply the dressings, allowing the pus to escape alonly. The drainage tubes should be of rubber, funestrated, one-fourth to three-eighths of an inch in diameter and about three inches long. To secure them from slipping into the cavity, the outer and should be transfixed by a large safety-pin before introduction.

Both the original operation and the subsequent dressings should be done with strict aseptic pressutions on account of the danger of secouslary infection, the occurrence of which adds to the secerity and prolongs the course of the disease. After the thord or fourth day the second tube may be control and the remaining one gradually shortened. Often, by the end of the fourth week, and sometimes before, the tube may be dispensed with altogether. The time of redressing and the removal of the table is determined by the amount of discharge and the temperature.

Simple incision with drainings is in infants to be preferred to rib resection. It requires less time, no general anesthetic, and is altogether a much less severe operation. Our experience is that following it pulmonary expansion takes place with more facility than when a large opening is made in the closet, and that in the great majority of cases it secures all the room required for drainage. There are, however, some disadvantages. The smaller opening may not give adequate room for the removal of large masses of fibrin. In old cases, particularly, it not infrequently happens that after the closet has been emptied the ribs become so closely approximated that but little space is left, and the drainage tules are pinched. Furthermore, the contact of the tubes may lead to crosson and superficial necroses of the adjacent ribs, sometimes to existence.

Include with Bib Resection.—This is the operation to be preferred with children over three or four years of age. It is sometimes needed as a secondary operation in cases which cannot be properly drained by the simple include owing to approximation of the ribs. The removal of an inch of rib is usually all that is necessary. This allows the insertion of the finger into the chest, the removal of masses of fibrin and the breaking flown of adhesions if any are present, and it secures free drainage. The extensive manipulation which is sometimes practiced in these cases with older patients is not admissible with young children.

Siplos Drainage.—This method of treatment introduced many years age by Bulau and recently revised and improved by Kenyon has much to commend it for young infants. The opening mode into the chest is a very small one admitting only a single large drainage tube. The wound is tightly strapped about the tube so as to exclude air. The thoracic talls is connected by a glass tale with several feet of rubber tubing and this with the wash bottle which contains a sterile salt solution. This bottle is suspended beneath the patient's bed or placed upon the theor. The character and the amount of discharge can thus readily be seen. As the tube often need not be changed for several



Fig. 78.— Discountry agent as One Ensystem of one Last Sine con which Estimates a Origination was Panmanus. Perform of five ribs were transmit. (From a photograph were justs after operation.)

days the child is spared the fatigue and distress of frequest dressings. The exclusion of air. diminishes the danger of secomlary infection and favors the expansion of the lung. The betthe in emptied once or twice a day, the air long meanwhile excluded by clamping the mae. The chief objection to this method of treatment is interference with drainage by the blocking of the tabe. Such an occurrence is at once recognized by inspection of the Said in the wash battle. A fileid. plag can sometimes by removed by suction, or by raising the botthe and allowing some of the sterile mintion to flow into the ched, afterwards siphening it out; but in many cases the tube must be removed to clear it. Even if this is carefully done by keeping a tight pad on the wound, air cannot be enclosed from the chest nor scomfary infection of the pleans entirely avoided. When repeated blocking of the tube or curs the treatment may have to be discontinued. The tube can usually be soon for ten or twelve days, after which it loosens owing to obseration about it and an airtight wound ean no longer le-

maintained. The short tube with the dessing of gause and softon is substituted. An extensive trial of siphon drainage leads us to recommend its use in many cases of empreson in infants.

Washing out the pleaned carrity is indicated in cases in which

the pur is foul. A single washing for the purpose of removing fibrin is the routine practice of some surgeous. For this a warm, sterilised salt solution should be used. Personally, we have selfour found this necessary. Repeated irrigations should not be employed. The usual daration of the discharge in cases treated by simple incision is from three to six weeks, the average being about five weeks.

A persistence of temperature or a fresh rise after operation most frequently indicates defective drainings, generally due to blocking of the tube; but this is not always the case. It may be due to prounonia, either a continumor of the old process or the lighting up of a new our,

to abscess of the lung, to emprema of the opposite side, to perscarditis, or to some cause outside the chest, very frequently otitis. The mistake is often mude of allowing the tubto remain for too long a time, so that a sinus is kept open which would otherwise close.

In chronic rases, or those which have been long neglected, some further sperative treatment is often necessary. The lung is so bound down by firmt adhesions that further ex- Fig. 75. James's Arranges you Excused one punsion is impossible, and even after the chest has re-



LUXU APPEN EMPTERAL

ceded to its utmost, so that the ribs are in contact, there still remains a emity which cannot close. For such cases the only hope is an operation by which portions of several rile are removed, thus allowing a greater collapse of the chest wall. This is known as "thoraplasty," or "Estlander's operation." The operation is of itself a serious one, and only to be plyised as a last resert in soveterate cases. Such an operation is, of course, always followed by very great deformity (Fig. 78).

Methods of Indicing Espension of the Lung .- In most of the cases. particularly the recent ones, complete expansion of the long takes place without any difficulty, the chief agent being the cough. In some cases this may be insufficient. The apparatus, during by James, shown in the accompanying cut (Fig. 79), serves at the many time as a tay for the child's anessement and as a most efficient means of inducing forced

expiration. One bottle is placed a few inches higher than the other, and the child blows a colored fluid from the lower into the higher bottle, allowing it to siphon back. Blowing soup bubbles often answers the same purposa.

SECTION V.

DISEASES OF THE CHICULATORY SYSTEM.

CHAPTER I

PECULIARITIES OF THE HEART AND CIRCULATION IN EARLY LIFE

The Petal Circulation.-During the latter part of fetal life the circulation may be briefly described as follows: The purified blood comes. from the placenta through the umbilical vein. Entering the body, it divides at the under surface of the liver into two branches, the smaller one, the ductus venosus, communicating directly with the inferior sens. cava; the larger branch joining the portal win, so that its blood traverses. the liver, and then enters the inferior vena cava through the hepatic rein. From the inferior vena cava the blood enters the right suriele, like that returned from the head and upper extremities by the superior vena cara. A mart of the blood now passes directly into the loft auricle through the foramen ovale; the remainder, through the tricusped orifice into the right ventricle. As the requirements of the pulmonary circulation are not great, only a small part of the blood is sent through the palmonary artery to the lungs; the greater portion passes from the pulmonary artery through the ductus arteriosus into the norta, joining here the blood from the left ventricle. The blood thus finds its way from the right heart to the left, only in small part by way of the lungs. the greater part passing directly from the right annicle to the left, or from the right contricte into the north through the ductus arteriosus. From the north, the blood renches the placents through the umbilical arteries, which are a continuation of the hypogastric arteries, which in turn are given off from the internal illines.

Changes in the Circulation at Birth.—With the ligation of the umbilical cord, the circulation through the umbilical coin and arteries and the ductus venesus ceases. With the establishment of respiration and the consequent increased demands made by the pulmonary circulation, the blood ceases almost at once to pass through the ductus arteriosus, and very soon through the foramen ovale. The umbilical vessels during the first few days of life are filled with small thrombi, which become organized. By the end of the first week, these vessels, so well as the

stactus venesus, are usually closed at their extramities, although they may remain partitions throughout the greater part of their extent for several works. They subsequently strophy to the condition of small fibrous roots. For some works before birth the circulation through the foramen orals is slight, it being gradually obstructed by the growth of a septum which nearly fills the space at birth. After the first work of extra-uterine life very little, if any, blood passes through it, although complete closure of the foramen often does not take place until the middle of the first year. In fully one-fourth of the autoputes we have made upon infants under six months old, there have been found minute openings at the margin of the foramen orale, but they are usually oblique, and closed by the valvular currain so as effectually to obstruct the current of blood. The ductae arterious is first closed by a clot, which becomes organized and breads with the products of a problerating arteritie. It is rarely found open after the furth day, and by the togetheric it is almost invariably obliterated.

Size and Growth of the Heart.—The relative size of the heart is slightly greater in intency than is later life, it being smallest at about the seventh year. The average weight at the different periods of life is as follows:

The growth of the heart is rapid during the first three years, and nearly proportioners to that of the body. It is showed from the third to the tenth year, and most rapid from the eleventh to the fifteenth year. At both, the thickness of the right ventriels is very nearly the same as that of the left, the ratio being \$0.7. The left ventriels, however, grows very much more rapidly than the right, so that at the end of the second year the ratio is \$1.7, which is nearly that of the rest of childhood.

The Pulse.—The pulse in early life is not only more frequent, but it is very more narrable than in adults. The following is the average pulse-rate in builthy children during sleep or perfect quiet:

Six to twilve menths	TOS bo	115	per.	misets.
Two to my system	99 *	103	(9)	
Seem to its years	190 °	90		
Flores to feasibles seek	25.4	350	140	

The pulse is a little more frequent in females than in males, and more frequent when sitting than when lying down. Muscular exercise or excitement increases the pulse-rate to from twenty to fifty bests. Very trivial causes disturb not only the frequency but the force of the pulse. The pulse in young infants may be irregular even in health and during sleep. When major, it is frequently irregular without special significance. No distribution is seen in the pulse waves of early infancy.

The circulation is much more active in infancy than in later shillbood; thus, according to Vierordt, the cuttre round of the circulation is accomplished in the newly been in twelve seconds; at three years, in fifteen seconds; in the adult, in twenty-two seconds.

Age.	Oune	Grane	Stario to Budy Weight		
Birth	0,50 1,25 1,87 2,25 2,80 5,84 8,20	34 35 53 61 50 106 241	1 to 225 1 to 280 1 to 222 1 to 226		

The figures in infancy are from one hundred and fifty-tire observations made in the New York Infant Archem; the others are taken from Subli.

Position of the Apex Beat.-In the infant the heart is pinced somewhat higher, and occupies a position a little nearer the horizontal than in the adult. This is partly due to the higher position of the diaparages. The apex heat is therefore higher and farther to the left than in adult life. According to the observations of Wassilewski and Starck, whose combined examinations with reference to this point were made opon over 2,100 children, the area lead is, as a rule, outside the nummary line until the fourth year; if it is less than one-third of an inch beyond the nipple, it can not be considered abnormal. From the fourth to the ninth year, the apex beat is in or near the mammary line. After the thirteenth year, under normal conditions, it is invariably within that line. During the first year the open bent is usually found in the fourth intercestal space; from the first to the seventh year, it is found with about cound frequency in the fourth and the fifth spaces; after the seventh it is usually, and after the thirteenth year it is always, when normal, in the fifth space. The position of the apex best may be comsiderably modified by severe deformities of the chest resulting from rickets, Pott's disease, or lateral curvature of the spins.

Examination of the Heart.—Inspection.—Bulging of the precordium is a frequent and important sign of cardiac disease during shifthcol. The cardiac impulse is generally weaker than in the adult, and often it is difficult to locate the apex bent owing to the thick layer of adoption tissue covering the chest.

Palpation.—This is usually a much more satisfactory method than is inspection for determining the position of the apex heat. For this purpose the child should be in the sitting posture, with the budy inclined alightly forward. Great displacement of the apex heat is always significant, and should lead one to suspect pleasitic effusion: losser degrees of displacement to the left indicate hypertrophy, especially of the left contricle; diagrantic pulsation indicates hypertrophy of the right contricle.

Percussion.-This may be done either by the finger or the percussion hammer. A light blow should be used, on account of the thinness and elasticity of the chest walls. In percussing the heart, changes in the percussion note are generally better appreciated if one proceeds from the lung toward the heart rather than in the opposite direction. The outline of the area of "relative" or deep cardiac dulness, especially in small children, is proportionately larger than in the adult. This may lead to the mistaken opinion that the heart is enlarged, when it is really of normal size. The upper boundary of this area is at the second interspace or the upper border of the third costal cartilage, at the left margin of the sternum; from this point the line of dulness extends in a curved direction outward and downward, the extreme left limit being at or slightly beyond the mammary line at the fourth interspace. On the right side the line of deliness extends downward from the second interspace in a slightly curved direction along the parasternal line. The lower harder is indeterminable on account of the liver.

The area of "absolute" or superficial cardine dulness, or that part of the heart uncovered by the lung, resembles in shape the same area in the adult, but it is relatively larger.

Auscultation.—This is of little value unless the child is quiet. For an accurate diagnosis the stethoscope is indispensable, but associtation should always be practiced with the ruked car as well. The rhythm and rapidity of the child's heart action are much more easily disturbed than are the adult's, and such disturbances are consequently much less significant. The rapidity of the heart in infancy is redinarily so great us to make it difficult to determine the exact period in the cardiac cycle at which a murrour occurs. Normally, the loudest sound is the first sound at the spex; the weakest sound is the second sound at the acetic orifice. The pulmonary second sound is regularly louder than the second nortic up to the fourteenth year and in some children almost to adult life.

In consequence of the small size and the thin walls of the clest, all sounds, both normal and pathological, appear relatively londer than in the adult, and the area of diffusion is therefore much greater. Thus it is a frequent occurrence for nurmars to be heard all over the chest both in front and behind.

Reduplication of the heart sounds, in consequence of the values of the two sides not closing exactly together, is not uncommon in children, and may be due simply to excitement. During the first four years of life nearly all the abnormal mormors heard are systolic. Accidental mormore are very common. They may be due to anemia and to many other conditions; although not so common as in objer patients, they are by no means rare in infants.

In older children, especially when lying on the left side, there is

eften heard a sound in the early part of diastole, the so-called "third beart sound." This is only heard in the region of the apex and always follows the second sound by an interval longer than occurs in true reduplication. The sound has the character of a dull, distant thad. It is never blowing. The sound probably results from the audden tension of the suriculoventricular values produced by the rapid entrance of blood into the ventricle. It should be recognized that this sound is not an abnormality. Failure to do so may cause errors in diagnosis.

CHAPTER II

CONGENITAL ANOMALIES OF THE HEART

Etiology.—Of the causes of congenital rardiac disease little is definitely known. It occurs more aften in first-born children than later ones; 16 of 50 cases being in first children (Still). It is often associated with other forms of imperfect development, notably of the brain, as in Mongolian idiocy. An attempt has been made to connect cardiac malformations with syphilis. A syphilitic family history is very seldem found; but Warthin has brought forward additional reason for suspecting syphilis since he has found that a positive Wassermann test is given by some of the children with congenital cardiac disease, but in our experience this has not been found with sufficient frequency to establish a causal relation. There has not been adduced any evidence to show that rhoumatism plays a part.

Lesiens.—The congenital anomalies of the heart may be grouped under three general heads:

- Malformations resulting from imperfect development of certain
 parts of the heart, most frequently one of the septa. Either the ventricular or the auricular septum may be affected, or that dividing the
 palmenary artery from the aceta. Such failure in development perpetrates conditions which are normal in the early months of fetal life.
 There may also be atresta of any one of the orifices, absence of one or
 more of the valvular leaflets, or of any one of the large vessels.
- 2. The results of fetal endocarditis. The effects of this condition vary accreding to the time of its occurrence. It is almost invariably of the right side, most frequently affecting the pulmonic valves. Valendar disease in fetal life leads not only to hypertrophy and dilatation, but also interferes with the normal development of the heart by preventing the closure of the auricular or ventricular septum or the ductus arterioses, these being kept open by way of compensation. It is not clear how.

important a part fetal endocarditis plays in the production of congenital Seciens, certainly not so important a one as it was formerly believed.

3. Persistence of fetal conditions, such as the foremen ovale or ductus arteriosus. This is usually by way of componenting for some malformation the result of imperfect development or of fetal endocarditis. Very rarely a fetal condition may persist when no sufficient reason for it can be found.

In the following table are given the lesions found in two hundred and forty-two cases collected from medical literature:

Progressy of the different lesions in 252 autopoins upon cases of caugesital cardiac asomula

Defect in the centricular reptum. Defect in the numeralar septum, or patent form-	149 can	ou; the	cety	losion	le 5	eases.
tem orale and a control of the contr	125.				. 0	
Palmonic itenous or atress	108 *				* 6	1
Palent ducties arteriorus	65 4		-		+ 3	10.0
Altestrukties in the engin of the great yearsh.	43. "	9.0			* 0	11.0
Palmone mulfirmery	37 3				* 0	
Tricupol insufficiency	6 4				* 0	
Tricuped stenous of atrests	3 4		-		* 10	
Mitral insufficiency	1 '				* 0	
Mitral atemosis or attenda	6 4				* 0	
Aortic insufficiency	1 1				* 0	
Aostic aleacoin or alresia.	0 4				* 10	
Transposition of the heart	2 4				* 0	
Estocomianoscopic	1 3				* 0	

The most frequent associated Irainar

Pulmonic elements with defect in the contrieu-									
he aptem. Pelmonic stenose, with defect in the agricular	102	cases,	He	only	lerious	m	20	ciente	ł
MPANEL COLUMN WILLIAMS IN the MARKING	DO:			-		*	8	*	
Defects in both upta	82			4			17	10	
Pulmenie stenous with defects in both septa.	35		•	-			21		

From this table it will be seen that, in the great majority of cases, several lesions are present, the most frequent combinations being pulnomic stemosis with defective ventricular septam; pulmonic stemosis with defective auricular septam; the three lesions associated; or the first two with a patent ductus arteriseus. Stemosis of the athenus of the aorta, although not noted in this series, is not a very ancommon lesion; the obstruction is in the arch of the arcta beyond the point where the large vessels are given off.

Defect in the Ventriculus Septum.—This is the most frequent Inion in congenital cardine disease, and in half the cases is associated with pulmonic stemsis. The defect is generally at the upper part of the

soptum (Fig. 80). It is usually from one-fourth to one-half an inch
in diameter, but not infrequently there is a large defect; or the septum
may be entirely absent, the heart then consisting of but three cavities—
two suricles and one ventricle. If the suricular septum also is wanting,
as may be the case, the heart has but two cavities. Frequently there are
also atnormalities in the origin of the great vessels. The pulmonary
artery and the aucta may be given off from a common sentricle, or
the sorts may arise partly from one centricle and partly from the other.
If pulmonic stenosis or alresis is

present, the opening in the ventricular septum is conservative, affording a channel for the pussage of blood from the right to the left side of the beart.

Patent Forance Orale, or Defeet in the Auricular Septum .-Although this is one of the most common congenital mulformations, it is not one of the most inportant. It rarely occurs alone, but is frequently found with pulmonic stensors or a defect in the ventrienlar septon. Small oblique openings in the suricular septum -estally at the foramen avaleare not infrequently met with in autopsies upon roung infants, but they are of no importance. In pathological conditions the opening is from spe-fourth to one inch



Fig. 80.—Commercial, Cammor Discour-The left contricts is shown with a detect in the ventrouser aspiner, the opening being just beneath the north valve, (From a patient dring in the Rabies' Hospital.)

in diameter, and there may be more than one opening. A defect in this septum is frequently secondary to pulmonic sterosis.

Patent Ductus Arteriasus.—As a solitary besion this is rare, but it is frequently associated with pulmonic steneous, usually with a defect in one or both septs. It is then one of the channels by which the blood may find its way to the lungs when the pulmonary orifice is obstructed. It is not a malformation, but simply the persistence of a fetal condition usually necessitated by other changes in the heart. But the direction of the blood correct is the opposite of that which exists in fetal life.

Pulmonic Stensors.—This is one of the most frequent and most important lexions. It was fermerly looked upon as being often due to fetal endocarditie, but is now believed in most cases to be due to a failure of development of the infunditiolum of the right vestricle. It is often a primary lesion, and when marked it is always accompanied by other changes, most frequently by a defect in one or both septa or by a patent ductus arteriosus. This is important, as being more constantly associated with cyanosis than is any other congenital lesion. Most of the chiblren who live beyond six or seven years with cyanosis have this lesion, always accompanied by others of a compensatory character. The amount of obstruction varies from a slight narrowing of the orifice to complete atresia. The seat of obstruction may be at the pulmonic orifies, in the cenus arteriosus, or in the pulmonary artery just beyond the salves. If there is atresia, the pulmonary artery is very small, and may be rudimentary.

Palmonic Insufficiency.—This lesion is relatively rare. It is usually the result of fetal endocarditis, but there may be absence of the pulmonary valve. It is most frequently associated with a defect in the untricular septum.

Tricupid, mitral, and anothe disease are very infrequent and usually seen in come with multiple defects. Atresia or stenoils is much more

remuce than insufficiency.

theoreticies in the Origin of the Large Vessels.—These are quite frequent; but, as will be seen from the table, they are always associated with other lesions. Three forms are seen: (1) Transposition of the large reseals—the pulmonary artery is given off from the left, and the seria from the right centricle. (2) Both arteries arise from a common trush. This is usually due to an incomplete development of the lower part of the septum dividing the two arteries. Usually the pulmonary artery appears to be a branch of the acets. This condition is frequently associated with other abnormalities, often with so large a defect in the contricular septum that there is really but one rearricle. (3) The north has an abnormal origin, arising from the right ventricle, or partly from both centricles. This also is associated with a large defect in the rearricular septum. When described as arising from both ventricles, the north is usually given off directly above the line of the septum.

An abnormality in the number of valrular segments is quite frequent, but seldom impairs the valve's function. In rare cases a valve is rudinautary, and it may be absent, generally at the pulmonic or tricuspid crifice. Absence of the right nuricle and absence of the pericardium have been recorded; also opening of the pulmonary usins into the right nuricle, and a single pulmonary artery. In one case in the series there was entocardia, this being associated with a conjournal fasture of the sternum. We have seen two very remarkable instances of congenital cardiac displacement; the heart was in both situated in the abdominal cavity. The pulsations could be plainly seen and felt just above the

umbilicus. In each case there was a congenital defect of the abdominal walls and also an opening in the diardragm.

Transposition of the heart, or true dextrocardia, was recorded but twice in this series of cases. The transposition of the heart alone is a very rare condition. It is not so unusual to find transposition of all of the thoracic and abdominal viscera. In the last two years we have seen three such cases.

Secondary Lesions.—In congenital malformations the right heart is usually found hypertrophied, since there are present one or more of the fetal conditions in which the greater part of the work is thrown upon the right ventricle. Such hypertrophy is in most cases accompanied by some dilatation. Changes in the moscular wall of the left heart alone are exceedingly rare. In four cases there was evidence of malignant conferentiates which was the cause of death, all but one of these patients being solubs.

Symptoms.—The symptoms of congenital cardiar disease are usually manifested soon after birth. 'Of 128 cases in which the time of the first symptoms was noted, they were congenital, or appeared during the first month, in 85; after one month and during the first year, in 18; from one to sixteen years, in 15; while in 10 no symptoms were observed until after puberty. Congenital cardiac disease is one of the causes, but not a frequent one, of death during the first days of life.

The most striking objective symptom is cyanosis. This is present in most of the severe cases; but, considering all varieties, examosis in more often about than present, and it may be about even with serious beions. It may be slight and noticed only upon exertion, at upon coughing or crying, or it may be intense and constant, giving the skin a dark, leaden color, and the musous membrane of the month a raspberry hoe. The view that evanosis depends upon an admixture of arterial and venous blood is generally discredited. In the great majurity of the cases at least, the explanation is a deficient oxygenation of the blood in the lungs, owing to some interference with the pulmonary circulation. In sixty-three per cent of the cases with cyanosis in the series, there was found pulmonic stenosis or stresia, or a small pulmonary artery. Cyanosis is of much value in diagnosis, as in acquired cardino illiense it is rarely persistent. The degree of syanosis and its constancy are of some importance in determining the gravity of the lesion. although evanosis alone is not to be depended upon.

Another frequent symptom is the enlargement of the terminal phalanges known as clubbed or "drum-stick" fingers (Fig. 81) and toes. This almost invariably accompanies cyanosis, and is generally proportionate to it. The enlargement, which usually involves all the phalanges, is probably due to venous obstruction. Occasionally there are seen dyspnea, colonia of the face of lower extremities, dropsy of the serous cavities, and hemorrhages, particularly hemophysis and epistaxis.

There is generally marked dyspines on exertion in the cases in which symmetric is present; but in most of those without symmets there is no dyspice, and in fact, no objective or subjective symptoms, even though the marked may be very load. The majority of the symmetric children are undersized and develop sleerly; in them the problem of nutrition is a difficult one.

In cases accompanied by cyanosis, or with obstruction to the pulmo-



Fig. 81.—Chawsens or the Pressure of Communical Heater Distant. (From a boy fire greats old.)

many circulation, a polycythemia is present. The increase in the number of red cells is generally proportionate to the cyanosis; the average of the teen cases studied in the Yamberbelt ("line by Wile was 7,495,000; the highest was 17,180,000. The hemislobin is usually correspondingly increased. In the series mentioned the average was 107 per cent, the highest being 130. The number of white cells is changed very slightly, if at all; the average in these cases was 10,200, which disproves the theory of blood concentration. The lost explanation of the polycythemia seems to be that it is compensatory, and that the blood hypertrophes like other tissues. The blood-forming organs are stimulated to greater activity by the demands of the tissues for caygen. The quantity of blood remains the same, but the number of red cells and the hemoglobin, and

consequently the oxygen-carrying power, are very greatly increased. This in part compensates for the smaller amount of blood that can traverse the lungs and there become oxygenated.

Diagnosis.—The most important diagnostic features are cyanosis, the presence of a load marmur, and signs of enlargement of the right boart.

Muranurs are present in fully nine-tenths of the cases. They are almost always systolic in time, are heard budiest to the left of the sternum, usually at the base or over the leady of the heart, rarely at the spex. They are in most cases widely diffused, often being andibbe all over the chest. The point of maximum intensity is important for diagnosis. In the great majority of cases only a single marriar is heard. A systolic marriar is usually due to pulmonic chaosis, defected ventricular septum or sortic stenoms, very rarely to midtal or tricuspid regargitation. Since these conditions are very often associated, it may be difficult to tell upon which one the marriar depends.

A patent ductins arteriosus usually gives a prolonged, continuous murmum with systolic intensification, which is londest in the second or third left interspace. From the presence of a continuous murmur in a child, a diagnosis of patent fluctus atterious can be made. The associated lesion is almost always polymenary atomais. In a young child, a load murmur at the base of the heart with symnosis almost always means congenital disease. A thrill is often present but it is not important for a diagnosis.

Enlargement of the right heart, chirdly from centricular hypertrophy, is present in most of the cases.

A diagnosis of the precise nature of the malformation is very deficult, and in the great amjority of cases only a probable diagnosis is possible. Nearly all the cases are complex, and the variety of combinations is very great. A study of the histories and autopases of the cases in this series reveals many apparently contradictory facts. Loud marmors are sometimes beard which are difficult to explain by the beions, and murmors may be absent when there is every reason from the post-mortem findings for expecting their presence. With reference to the other conditions, we can not do better than give the more frequent clinical symptoms with the results of the autopoies in the series of cases which have been presented.

A Systolic Muranur at the Base with Cyamois.—This was the most common combination not with, and was present in about one-third of the entire number. In over eighty per cent of the cases with those symptoms, pulmonic stemosis was faintly. The remainder were complicated mass of quite a wide variety. Pulmonic stemosis was usually associated with a defect in one of the cardiac septa, or a putent ductus arteriorus.

A Symbile Marmor without Cymnosis.—In this series of autopoies this was not a frequent combination, being noted but six times. It is invally dependent upon a defect in the centricular septum without palmonic stenosis. Clinically, however, this is more often seen, in fact it is one of the most seminon types. The morniur is generally loadest at the left margin of the stermin at the third space. There is a striking absence of all other symptoms. We have watched a number of such paticular grow to maturity and go through secious attacks of illness without showing any symptoms referable to the heart,

A Symplic Marson at the Apex with Commonic.—Of the six cases with this combination, all were examples of complex multirmation, the most frequent lesions being a defect in the surricular seption, transposition of

the great vessels, and patent ductor arteriorar.

Connects without maraners was noted fourteen times. It recally indicates either pulmonic atrosia or the transposition or irregular origin of the great vessels, but is cometimes seen when lesions such as usually give murmurs are found at autopay.

Distrible marways were beard in but two cases, and depended apon pulmonic insufficiency. Diastolic marmors are also bound when an acute endocarditis causing sortic or pulmonary insufficiency supervenes apon a congenital lesion. We have seen one such case and several lase been reported.

Absence of both comunic and nurmure was recorded in five cases. The lesions found were; atresia of the aorta, both arteries arising from

the right ventricle, or defective septa.

The only cases, therefore, in which a fairly certain anatomical diagnosis can be made are those of pulmonte stenosis, deficient ventricular septum, and patent ductus arteriosus.

Diagnosis of Congenital from Acquired Disease.—Congenital discase may be suspected if the patient is moler two years of age; of there is no history of previous rheumatism; if the nurmur is atypical in its location, character, or transmission; if there is a very lond nurmur at the base or over the body of the heart, and if there is evidence of enlargement of the right heart. If cyanosis and clubbing of the fingers are present the diagnosis is almost certain.

Especially difficult are the cases without epanesis seen in older children. But absence of hypertrophy of the left sentricle, continued absence of subjective symptoms, even with a very loud marmor, and a losion which does not increase—all point strongly to a congenital malformation.

Diagnosis of Congenital from Accidental Muraners.—This is often a more difficult matter than to decide between congenital and acquired decase. From a normal alone one should be very cautious in making a diagnosis of cardiac malformation in a very anemic infant. Anemic instructs are systolic, usually basic, unaccompanied by enlargement of the heart, usually heard in the caroticle, often in the subclavian arteries, but are seldem so loud as those due to malformations. In some cases it may be recessary to watch the progress of the case before deciding the question.

It is not uncommon in children to find at about the level of the nipple at the left border of the sternum a soft systolic murmur best heard in the recumbent position, which, as it usually disappears, must be considered functional. It may be mistaken for a congenital memour, but is not so load.

Prognosis.—Of 255 cases, 60 per cent were futal before the end of the fifth year, and scarly one-half of these during the first two months; while sixteen per cent of the patients lived over sixteen years, and eight per cent over thirty years. The prognosis in cases without cyanosis is good; in many children the lesion has apparently little effect on the health or development. The prognosis is much worse in cases with cyanosis, and generally it is had in proportion to the degree of syanosis. The londness of the maximum has no prognostic importance.

In the cases fatal soon after high the usual lesions are large defects in the septa, transposition of the great vessels, or pulmonic afresia. In five of twenty-three cases dring thus early, the heart had but two cavities. Lesions which are computible with the longest life are minor septum defects, and pulmonic stence is which can be compensated for by patency of the shortes arteriosus and in other ways. Many exceptional instances are recorded in which putients have lived a long time in spite of extreme deformities. One child with transposition of the pulmonary artery and aoria lived two and a half years. Tielemann's patient lived eleven years with a heart consisting of three cavities-two auricles and one reatricle-and with constant cranssis. In three cases reported by Bekitansky, the patients lived over forty years with redimentary auricplar septa; gyanosis is not mentioned as being present. Gelpke's patient had cranesis, and lived twenty-seven years with rudinoutary nuricular and tentricular septa, and with no tricuspid opening. Patients with serious congenital cardiac lesions are repecially succeptible to pulmonary disease of all kinds and occasionally develop malignant endocarditis. Almost any acute illness man proce futal,

Treatment.—These justients are prope to develop at times attacks resembling angina pectoria, which are best relieved by nitroglycerin or by the use of morphin hypodermically. No treatment is of the slightest avail in dominishing the amount of deformity or promoting the closure of any of the abnormal openings. All cases are to be treated symptomatically.

CHAPTER III

PERICARDITIS

INTLARMATION of the pericardium is uncommon in infancy and early childhood, only two cases being som in 526 consecutive autopsies at the New York Infant Asylum. But in later childhood pericarditis is more frequent and more serious than the same disease in adults.

Pericarditis is about invariably a secondary disease, following (1) emovema or pleuropoumenia; (2) arute rheumatism; (5) acute infactions diseases, especially searlet feron; (4) pyemia; (5) Inberculosa; (6) local conditions. The relative importance of these causes differe with the age of the child. In infancy and early childhool nearly all the cases complicate disease of the lung or plours, more frequently of the left side. After the fourth year rheamatism takes the first place as an ctiological factor. Pericarditie is then generally associated with endoconditio, and may precede or follow the articular manifestations of theumatism. Following scarlet fever, pericarditis often occurs in connection with rephritis or multiple joint inflammations. In typhoid fever also it is usually associated with presumonia or joint lesions. Pyemia may he a cause in the newly horn, or it may occur in connection with distant of the lones or joints in older children; in both it is usually associated with similar beions of other serous membranes. Tuberculous pericaelitis is more frequent after the third year, and is generally secondary to pulmonary fulnivations. Among the local causes may be neutioned tranmatism, alteration of a foreign body from the couplingue into the pericardium, discass of the stormum, rile, or vertebrae, and abscesses resulting from cheen broughtal lymph nodes.

Lesions.—Periordial transmissions, or an increase in the normal periordial fluid, are not with in many conditions in which there is a very marked degree of mermia, general droppy, or a weak heart, particularly of the right side. Generally from one to two success of clear serum are found in the pericardial sec.

Promosocous persarditis is always scate and closely resembles in its lessons the inflammation of the pleura due to the same cause. In the milder cases there is seen only a fibriuous exudate. In the nore common and more severe forms the visceral and parietal pericardium is covered with a thick coating of fibrin and pus (compare pleuropuremonia), or noise per cells and serum may be poured out and the ancontain finid pus. The amount is usually small, one-half to one once, but it may be as much as a pint. When the inflammation is excited by other progenic organisms, the staphylosocous or the streptococcus, the besiene are similar to those just described. In themsatic pericarditis the inflammation may be a plastic one with a fibrino-cellular exactate (dry pericarditis) or sera-fibrinous (pericarditis with effusion). The inflammation generally begins at the base of the heart and affects both the viscoral and parietal layers. The quantity of fluid present is usually small, not exceeding two or three concest exceptionally as much as a pint may be present. It may be clear or alightly turbid. More important than the pericarditis are the associated changes in the heart muscle. These are present in every severe case. To the myscarditis and consequent dilutation the most serious symptoms of pericarditis are due.

Purulent pericarditio may be set up by a foreign body alterating into the sat, by the rupture of a mediastical abscess, or by general pyemia. In these circumstances the process may be purulent from the outset.

Any of the pyogenic bacteria may be found,

External or mediastical pericarditis is always associated with mediastical plearisty, and results in more or loss extensive adhesions of the pericardial and pleared surfaces, with an increase in the connective tissue of the nediasticum. This is often a tuberculous process. When severe, it may cause compression of the large blood-vessels, but seldom in any other way produces symptoms. With this form there is usually inflammation of the internal layer of the pericarditism as well. Only inflammation of the internal layer is ordinarily considered as percenditis, the other form being preferably classed as mediastinitis.

Pericarditis with an effusion of blood is very rare in children. It may seem from the rapture of organized adhesions or in certain blood states

each as purpura, and very rarely in tuberculosis.

With scute tuberculosis there is usually only a deposit of usitiary tubercles, or there may be a small scrous or sero-sanguinedent effusion. In abronic cases there may be a tuberculous inflammation with the formation of caseous nodules, new connective tissue, and extensive adhesions. This generally occurs in connection with pulmonary tuberculosis—sometimes with tuberculous peritoustis.

In any form of pericarditis complete recovery, as far as pathological conditions are concerned, is rare—if, indeed, it ever occurs. After a rheumatic pericarditis adhesions remain, which may be slight, but are often complete, causing entire obliteration of the pericardial sac. Such adhesions are followed by secondary changes. The growth and development of the heart are interfered with, and there may be sufficient pressure upon the coronary vessels to lead to degeneration of the muscular walls and chronic dilatation of the heart.

Symptoms.—A pericardial transmission, or dropsy of the pericardium, is very rarely large enough to make a diagnosis possible.

External pericarditis is seldom recognised during life, there being no

symptoms except those of the planticy with which it is associated. Occasionally there may be heard, particularly if the inflammation is anterior, a pleuritic friction sound which is increased with the systols of the heart. The pulse may be weak during inspiration, and there may be an increased area of cardiac dularess. If the inflammation is chiefly posterior, it causes only the symptoms of methastinitis, which is recognized principally by its pressure affects upon the great vessels. It may produce elema of the face or of the lawer extremities, socites, enlargement of the liver and spleen, but rarely allounimously. It is morally progressive, and lasts from a few months to two or three years, according to its cause.

Percenditio in infancy is usually averlooked, not only on arrount of its rarity, but also from the obscurity of its symptoms. When percenditia develops at the height of an attack of pneumonia, as it usually does, there may be no new symptoms, or at most only increased prostration with perhaps a more rapid or slightly irregular pulse. On assembation, if practiced early, one may hear percendial friction seconds; but these are musted by the pulmounty signs and in infants seldom made out. The most striking sign is that the cardiac sounds formerly distinct are now feeble and distant, at times almost inaudible. Later there may be increased deliness from percential effusion, or from dilutation. The physician about he on the watch for it in infants with pleuropneuronia, especially of the left side.

Reconstic pericardata affecting as it generally does older children is easier of recognition. Localized pain and tenderness are usually preent and also a certain amount of embarrassment of the heart's action, manifested by precordial distress, palpitation, or a tunnilmous heart action with a rapid and at times an irregular pulse. There is often vonting, dispuse, and a busing, dry cough; there may be orthogree and some syanosis. Sometimes there is delirium,

The earliest physical sign of pericarditis is a friction sound which can generally be heard all over the precedium, though semetimes only over a small area at the base. The sound is usually a double, to-and-fro sound, synchronous with the movement of the heart. In character, the sound is rough, senatching or grating, not at all blowing in character, and, while it may be heard widely over the heart, is not transmitted. With the occumulation of the fluid, the friction sound may only be heard over a restricted area, but almost always possists at the base even though fluid may be present in large amount. It differs thus radically from the friction sound in pleasing with affusion. Very early these is an increase in cardino dulness which is often considerable. This may be due to offusion or to cardino dilatation, which is apt to occur in all severe cases of pericarditis. With early and rapidly developing dulness it is safe to assume that some dilatation is present. The dulness

can be made out both to the left and to the right of the heart. On the right side it is usually first noted in the fifth right intercostal space with an obliteration of the normal scate cardiologistic angle, an obtase angle resulting. The dislaces is nully does not extend more than an inch or two beyond the right border of the sterants and a similar distance beyond the left maintainty line, but with very extensive effusion there may be duliness to the right of the right maintainty line, and as far as the left anterior axillary line. (Figs. 81, 83.)

The area of dalness with small effusions is triangular or pear-shaped with the base below. With large effusions it is almost circular, in which



Fig. 82—Pantenium with Erronne. Anterior view, showing moderate distention of the percurchan, especially to the left of the middle line; eight bester at A. Ber eight years old.



Fig. 83 Princate ten wern Errescot. Suise patient as Fig. 82, but taken four dare later. Great distention of the perioankina; right burder at B. Complete recovery by absorption

case the cardiologatic angle again becomes neute. There also may be dishess to the left of the vertebral column behind. When there is considerable effusion, the apex beat is feeble and may be displaced appeard. It may be impossible to locate it. The cardioc sounds are diminished in intensity and may be almost inaudible. Of assistance in diagnosis is sometimes the disproportion between the cardiac sounds and the force of the pulse—the latter may be nearly normal when the cardine sounds can barely be heard. As the result of persoure upon the long from large accumulations of fluid, broachial breathing may be heard posteriorly, at and inside the space of the scapula.

In cases terminating faintly the progress of the discuse is quite rapid, the entire duration being seldem longer than three or four weeks, and it may be much less. Provincials often develops toward the close. When embing in receivery improvement is very slow and it may be two or three months before the patient is out of bed, and a much longer time before two a moderate degree of health is established.

Prognosis.-Acute perimelities due to the preumoscous in infance

almost invariably ends fatally and in older shiften this is the usual termination. Occasionally at the later age resolution may take place before pus forms, or the propericardium which causes is successfully opened and drained. Purulent pericarditis from other causes is usually fatal. In rheumatic pericarditis the author's for life is better, but this with its associated myocarditis is without doubt the gravest manifestation of rheumatism in early life. No complication is more to be dreaded, both on account of immediate and remote dangers. Of forty-eight cases of acute pericarditis reported by Still in which this supervened during endocarditis, forty proved fatal in the course of a few weeks. In particular who do not die from the disease the remote consequences by reason of adhesions and subsequent dilutation are very serious.

Diagrania.—Pericardatis is recognized by knowing when to look for it—in infants with pneumonia, in older children with rheamatism. The difficulties of diagnosis of dry personditis are very much greater in young children owing to the very rapid action of the heart. Dry pericarditis is recognized by the friction sounds, which are bost heard over the base and are to be differentiated from subscardial nurmors. Pericarditis with effusion is to be differentiated from dilutation of the heart and from pleuritic effusion. From dilutation, the diagnosis is very difficult in childhead, but the recognition of small effusions is not assential, since the important condition is the accompanying dilutation. Large effusions may be mistaken for a succulated empyorm of the left side; in the latter, however, the heart is generally crowded to the right. When empyorm and pericarditis coxxist, if may be impossible to recognize the condition. The diagnosis between screws and puralent uffusions can be made only by asporation.

Treatment.-In an attack of ariste pericarditis the patient should be kept in bed, absolutely quiet, and an ice-lag used over the heart. A layer of thin flannel should be placed to reath the bug. During the arete stage it should be applied constantly with perhaps a few hours' omission during the night. To be effective much attention to detail is necessary. Some children will not tolerate ice and for them dry heat may be substituted. It often mitigates the pain. Counter-irritation by mustard from time to time is useful, but blisters should not be employed. in children. Leaching is much used in England, not so much in this country as its merits warment. Four or five leveless are applied over the stermon or liver. The especial indications for the use of leeches are cyanosis, marked dyspace, and follatation as shown by increase in the cardiac dulness. A rapid increase in deliness is to be regarded as mainly due to dilutation rather than effusion. Opium is, to our opinion, of more value than any other drug. It has a steadying influence upon the excited heart, it relieves your and also galets the distressing cough. The

form of administration is immuterful. The patient should be kept moderately under its influence throughout the active stage of the attack. Digitalis is sometimes useful, but must be used with caution. Alcohol is not indicated. Stryclinin and caffein may be used when symptoms of heart failure are present, but very little is to be expected from any drug-For the concurrent rheumatism anti-rheumatic remedies should usually be continued. Serous offusious usually subside under general treatment. With very large serous effusions aspiration may relieve distressing symps toms, after which the rest of the fluid may undergo absorption. If the exploring needle shows the fluid to be purulent, incision and drainage should be practiced as in empyona. The results of aspiration for pyr-pericardium are exceedingly unfavorable. Of eighteen cases collected by Keating, only four recovered. In puncturing the perioardium the point usually selected is a little to the left of the border of the sternum in the fifth intercostal space, the needle being directed upward and outward. In cases which do not sud fatally a prelonged period of rest in bed is imperative on account of the dilatation.

CHRONIC PERICARDITIS WITH ADDIESIONS

This is not a very amounton condition. It is usually general, but may be localized. The youngest case which has come under our observation was in a child sexteen months old, who died from acute beorehopneumenia. The adhesions were old and general, the pericardial sacbeing completely obliterated. Chronic adhesive pericarditis may follow single or repeated attacks of acute rheomatic pericarditis; it may be tuberculous. The pericardium may become very greatly thickened and its cavity obliterated; it may be adherent externally to the pleura, diaphragm, and chest wall. Other changes are usually present in the heart. It is often the sent of chronic myocarditis; the cavities are usually greatly dilated, and the heart walls much hypertrophied. Valvular bosions may be present.

Partial adhesions cause no symptoms by which they can be recognized, and even general adhesions sufficient to obliterate the pericardial sac may be found at rutopoy when not suspected during life. This is one of the conditions in which, after it has led to considerable dilatation of the heart, sudden death semetimes parties. Usually there is paller, elight eyanosus, localized edema of the cheet and abdominal walls, and dyspusa upon slight exertion. The liver and spleen are aften cularged and there may be assites. These symptoms often lead to arrors in diagnosis.

The heart is almost invariably much calarged, chiefly from dilatation.

On inspection, there may be halging of the clost wall, with a defined and often fieble or absent uper lest. The characteristic signs are a available retraction of the chest at or near the grex of the heart, sometimes at the tip of the sternum. This is due to the external pericardial adhesions, and is often better appreciated by subjutton than by impertion. It is followed by a rapid rebound, associated with diastelic collapse of the jugular veins. A pulma paradaricae may also be present. Percussion shows an increase in the cardiac dulness in all directions. The position of the arex and the pervussion entires of the heart do not change with the posture of the patient, and the cardiac dalnoss is last little affected by full inspiration. A systolic murmur is often present. The diagnosis of adherent pericardium about presents difficulties, but it can be made with tolerable certainty in a considerable proportion of cases. On account of the enlargement of the heart and the frequency of murmurs, it is usually mistaken for valvular disease. The progresse is very bad. The bosion is a permanent one, and tends to increase. The treatment is symptomatic.

CHAPTER IV

ENDOCARDITIS AND VALVULAR DISEASE OF THE HEART

Expocamoras may occur even in fetal life. At this period is neaally affects the right side of the heart, and is one of the important cuses of congenital multicrustions. In infancy, sente subscarditis is excedingly rare, but a single instance being found in over two thousand sutspsics upon clabben under three years of age of which we have records. From the third to the lifth year it is less rare, and after five years is quite common.

The following table gives the age and sex in a series of cases of valeular disease:

Ace.	4	-	4	4	-	4	-	-	-	=	=	12	=	=	Trak
Males Fernales		1	200	20.00	4 7	8	10	9 3	8	8 12	514	7.4	6 2	1 8	40,0e38% 90, *62%
Total,		2	3	4	11	15	14	12	10	13	33	11	8	1	145

The proportion as to sex is very nearly the same as in our cases of rheumatism. Sturges, in 100 cases of chronic endocarditis, gives fiftysix per cent females and forty-four per cent makes. Endocarditis is usually spoken of as accordary to rheumatism; it is rather to be regarded as a manifestation, often the first, of that disease. Of 117 cases in our series, ninety-three, or eighty per cent, gave a history of previous rheumatism. Of the 31 cases which at the first examination gave to history of rheumatism, 8 subsequently developed articular symptoms, and 2 chores; so that nearly ninety per cent of this series of cases presented canclasive evidence of a rheumatic disthesis. Thirty per cent had choren previously, or developed it while under observation. The proportion of rheumatic cases corresponds very closely with Cheudle's observations. In a series of 150 cases of valvalur disease, Still found distinct evidences of rheumatism in 148.

Endocarditis may occur alone or with other manifestations of rhenmatism. While frequently associated with acute articular rheomatism, in a much larger number it is seen with articular symptoms which are so slight as to be overlooked entirely or passed over us unimportant. It may serur with or follow choses, tonsillitis, or torticellis, with or without articular symptoms. The proportion of rheumatic cases in which endocarditis occurs is much larger in children than in adults. In rare instances endocarditis is seen in the course of almost any of the infectious diseases, most frequently with scarlet fever, being often associated with pericarditis; but even in these conditions it is possible that it is sumetimes rheumatic. The factoriology of rheumatic endocarditis has not yet been determined with certainty.

Lesions.—In the great majority of cases enformalitis affects the notral valve, and often only this. In 150 autopaies upon children dying of cardiac disease, Poynton found the mitral valve involved in 149, but in 76 of these the changes were not marked; in only 9 was there marked mitral stenosis. The nortic valve was affected in 51, but in only 9 was it seriously involved. Very striking was the frequency of pericarditis. Pericardial adhesions were present in \$13 cases, and in 77 the adhesions were complete, i. n., the pericardial sucity was obliterated. These findings agree antistantially with the observations of other English authorities, but in America the pericardial besions are certainly not so prominent.

The pathological changes of neate endocarditis do not differ essentially in early life from those seen in adults. There is first an accumulation of hacteria upon the endocardium of the values. These produce necrosis, which is followed by a riot formation, consisting chiefly of blood platelets and fibrin, in the meshes of which are lenkovytes and a few red cells. The next change is a growth of new connective tasses cells and bloodressels, which may be slight and superficial, but the rheumatic lesion usually extends deeply with an extensive proliferation of connective tissue which after a time undergoes contraction.

In the mildest forms of endocarditis it is possible for complete recovery to take place. In other cases there is left only a slight valualar thickening, not enough to interfere in any important way with function. In most patients, however, more marked changes are left. The sulvular segments are swellen, a thereat, somewhat shortened and consequently insufficient. Other changes in the heart usually accompany scate endocarditis. Dilatation is almost invariably present and is an important factor in producing insufficiency. In cases ending fatally there is very little hypertrophy; but if recovery scenars, hypertrophy develops and the lesion is compensated for in this way. A certain amount of myneardina probably securs in every severe case. It is most marked when pericarditis is also present. Emboli in children are rare. Subsequent attacks are exceedingly common and each one leaves the heart more seriously crippled.

Chronic inflammation may follow the first attack or more often accurafter repeated attacks. The changes resulting from chronic endocarditis
are practically identical with those seen in adult life and need not be
described here. Emphasis, however, absolid be laid upon the fact that
the younger the child the more rapid the progress of the disease.

Symptons.—When endocarditis occurs as a primary disease, or when it is the only manifestation of rheumation, it may begin alruptly with rather severe general symptons—a temperature of 100° to 100° E, prostration, exaggerated heart action, restlessness, and sometimes dyspeca. More frequently, however, it begins much less acutely with only general malaise and slight lever, which often is not recognized without the thermometer. If the heart is not watched the diagnosis is not made and there may be no suspicion of the nature of the primary attack until some time afterward, when the existence of valuatar disease is discovered. If, however, the heart is carefully and frequently examined there is beard, unsally on the third or fourth day of the illness, a soft, blowing, systalic marrows at the apex.

Endocarditis occurring with the ansatism is by no means limited to those attacks with well-defined articular symptoms. It is very common and often severe when the articular symptoms are no more than stiffness, pain on motion, and slight swelling of the feet or ankles. There is no relation between the severaty of these symptoms and the conceaness of the cardiac lesion. Occurring during cloress or after tomillidia there may be nothing to call attention to the heart except sometimes an increased rapidity or arregularity of the pulse and possibly increased prostration; but frequently the cardine condition is not suspected until the heart is examined.

Most of the cases of sente endocarditis seen in this country are of this mild type. Attacks of such severity as to produce death in the arate slage are relatively rare here, in marked contrast with the abscrutions of English writers.

The usual duration of scute endocarditis is from two to four weeks, the general symptoms slowly subsiding and, if the case progresses favorably, the cardiac symptoms improve, but there is usually left behind a somewhat damaged heart because of valudar disease. In cases progressing unfavorably a fatal termination may come in the course of from two to six weeks awing usually to one of three causes or a combosation of these: (1) The rapid development of dilatation accompanied by the usual signs of cardiac insufficiency; (2) pulmonary complications, generally presuments; (3) the supervention of scute perion-litis.

Course of Chronic Valvular Disease.—Chronic valvular disease follows one or more attacks of scute endocarditis, and may exist for months
and sometimes for years, before it is recognized. Its course is usually
divided into two periods, the first being that in which compensation is
present, and the second after compensation has failed. The duration of
the stage of compensation is indefinite. The only subjective symptom
that is of much diagnostic value is shortness of breath an exertion. Occasonally other symptoms are present, such as precordial pain, attacks of
pulpitation, headache, epistaxis, anemia, loss of weight, and cough.
These are rarely constant, but come on when the patient's general candition for any reason is below normal. As a rule, there is in young
subjects a tendency to an increase in the disease, although this is often
slow, and may be interrupted by long periods in which the process appears to be stationary. At such times the patients either have no symptoms, or suffer only from a slight amount of inconvenience on marked
exertion.

Pailbure in compensation is generally brought about by one of the following causes: The most frequent is an intercurrent attack of theumatism with a fresh endocarditis, which in a short time leads to a very
great increase in the heart's disability. It may be due to additional work
thrown upon the heart from excessive muscular exertion, or to the strain
of a prolonged attack of some scute illness, especially one that is limble
to produce changes in the heart muscle, such as typhoid, diphtheria, or
scarlet fever. It is sometimes the increased work which is thrown upon
the heart especially at the time of puberty, oning to the rapid growth
of the body. It may result from any cause which seriously affects the
patient's general mutrition, particularly when this is associated with
marked apendic.

The symptoms indicating failure of compensation are marked dyspnea or orthopten and cough, sometimes accompanied by profuse expectoration, which may be bloody, and in race cases there may be larger pulmonary homorrhages. With these may be associated other signs of reducement congestion and even pulmonary edems. The obstruction to the systemic reasons circulation leads to dropsy, which usually begins in the feet, sensetimes in the face. There may be general anasates and dropsy of the serons savities, especially the peritoneum and plears; also sulargement and functional disturbances of the liver, enlargement of the spleen, dyspeptic symptoms, and chronic congestion of the kidner, with somety urare and allominaria. There may be dilutation of the superficial terms and symposis; and there may be cerebral symptoms, such as lendrate, decriness, and fainting attacks. The pulse is small and soft, and the heart's action rapid and irregular; the cardiac sounds are feeble and often indistinguishable, and it may be impossible to decide what marmurs, if any, are present.

It is rare to see all the symptoms of chronic progressive cardiac failure in children under seven years, but toward the time of puberty they are common enough. The symptoms may increase in severity until death occurs, or they may be severe for a time and then nearly disappear, to return again after a longer or shorter interval.³ Death may be due to sudden cardine paralysis, to intercurrent nephritis, pneumonia, embelling, inflammation of the serous membranes, or to edema of the lungs.

Physical Signs,-Mitral murmurs are altogether the most common

At autopsy the heart weighed fifteen unions. There was a very great hypertrophy, especially of the right ventricle, which was as think as the left. All the crotters were much dilated. The most important valvahir boson was native stemosis, the review not admitting the end of the lattle larger. The valves were the sent of calcurrous deposits. The curtains of the notic valve were therefored and afterest; there was also therkening of the pulmarae and tricooped valves.

[&]quot;The course and immunition of these cases of chronic vulvular disease is well illustrated by the following history of a little girl who was under observation, for mise years. When first seen also was seven years old, and gave a history of ordine symptoms for one year. There was then present a local natural regargitant marmar, with considerable hypertrophy. These was general dropy, and all the symptoms pointed toward acute dilutation. Under treatment, the tropy and other symptoms designed, and she west on constantiably for ever a year. In her eighth and night years there were frequent stacks of schools rheumation, during which time the heart lesion steadily hereased in security. At twelve years there was an emption of subcutaneous tendinous modules, which remained for ever two years. During this year there was heard for the first time a precyclide instral marmar, accompanied by a very marked thrill, mirristrations having been gradually brought about by the slowly progressing endocredits. This marmar gradually immensed in intensity from that time, while the natural regargitant marmar became less distinct. The spec best was then in the sixth space, two and a half makes to the lieft of the night. From the twellth to the fifteenth year she gree very little in height or weight, and showed no signs of marmity, the cooline symptoms being nearly stationary. In the afficient year she developed a marked enlargement of the liver and spices with general droppy and all the supplement engagement of the liver and spices with general droppy and all the supplement engagement in addition to the others fact or supplements. The symptoms dampered under treatment in the cause of a few moreths, but an months have returned with greater assertly and was secondaried by allowaitsies, the patient dying from heart failure in a few weeks. During the last connectbation there was beard a double matrial massian.

both in a sate and chronic disease. Of 141 cases of ralvular disease, in children under fourteen years, abserved clinically, mitral marmura were present in 135; in 131 the marmur of mitral insufficiency was heard, and in 50 this alone. In mitral insufficiency there is regargitation of blood from the left ventricle into the left auxicle during systole. There is heard a systolic marmar, synchronous with the agex impulse and with the first sound of the heart, which may whelly or in part replace the first sound. It is bordest at the apex, transmitted to the left, and is usually heard at the inferior angle of the left scapula. In arute endocardatis the murmur is at first very soft and usually increases in intensity for several days. It may be represented by the syllables "whoo-ta" perconneed in a whisper. After attenuing its maximum the marmar changes but little for some time. It may then diminish and eventually disappear entirely; but usually a murmur of moderate intensity remains. The only other important sign of acute endocardina is enlargement of the heart which is almost entirely from dilutation. If the acute inflammation. supervenes upon an old lesion, the previous murmur becomes lender and harder. In chronic endocarditis the murmur is similar to that of acute endocarditis but generally louder and more widely diffused, and may be andible all over the obest. It is accompanied by an accentuation of the pulmonic second sound and by signs of hypertrophy, especially of the right heart. When both these signs are wanting, the existence of mitral insufficiency is somewhat doubtful, as a similar murmur may be functional or accidental. In the early stages of the disease and during compensation, the signs of hypertrophy predominate; in the later stages or with broken compensation, those of dilatation.

Mitral stenoses is relatively uncommon. It occurs after repeated attacks of rheumatism, with a steady progressing endocurditis. It is nanally associated with mitral regurgitation. With this lesion there is obstruction to the flow of blood from the left nuricle into the left ventricle. It is mainly compensated for by hypertrophy of the right ventricle, but to a certain degree also by hypertrophy of the left nuricle. The characteristic murmur of fully developed mitral stenosis is presystelic, prolonged, rough in character, and terminates abruptly with a sharp first sound of the heart. It is londest at or just above the apex, but is and the over only a circumscribed area. Quite as constant and important for diagnosis is the presence of a "princing thrill," which is very distinct upon palpatien, and terminates sharply as the apex strikes the chest wall. This murmur is not common in children and is heard only in cases in which cardiac disease has lasted several years.

With milder grades of mitral stenosis, or earlier in the course of the disease, there may be heard, shortly after the second sound, a marmor sefter in quality and of short duration. It is usually audible above and to the inner sole of the apex beat. In point of time this is often spoken of as the early diastolic nurmur of nutral stensors. It may be represented by the whispered syllables "whoo-ta-whoo," in which the first syllable is the mitral systolic nurmur, which is somewhat prolonged; the second syllable is the second cardiac sound; the last is the early diastolic nurmur, which is much shorter than the systolic nurmur. The pulse of mitral stensors is notally small.

Aortic lesions in children are much less common than mitral lesions. with which they are usually associated; they are seen in rather elder patients. Aortic insufficiency is much more frequest than nortic stenosis. We have never seen it as the only lesion. It causes a regurgitation of blood from the aceta into the left centricle during diastole. It is compenated for by dilutation and hypertrophy of the left ventricle. The signs of acetic insufficiency are a prolonged diastolic murmur, with or taking the place of the second sound of the heart, generally loudest at the left barder of the stermon in the third space, and transmitted downward to the spex of the heart or the ensiform cartilage. This is invariably accompanied by signs of hypertrophy and dilatation of the left centricle, which are usually marked. With great hypertrophy there is often halping of the precordial area which may produce striking thoracic deformity. A characteristic symptom is the intense throlding of the carotids, with the endden distention followed by a complete sollapse of their walls, and the "water-hammer" pulse of Corrigue. A capillary pulse is often seen.

Acrtic etensors, unless congesital, is very rare in early life, and almost never occurs as the only lesson. Acrtic stensors is compensated for by hypertrophy of the left ventrade. It causes a systolic murmur, which is usually londest at the right border of the sternom in the second space, and is transmitted upward, being distinct in the carotids. The second sound is generally weak and may be replaced by a diastolic murmur. A systolic thrill over the acrtic area is usually present. Without the signs of hypertrophy of the left ventricle, a positive diagnosis should not be made.

Tricuspid insufficiency is usually secondary to disease of the left side of the heart, occurring in its late stages. It most frequently follows mitral insufficiency, when it is usually due to dilatation of the right ventricle without changes in the values. It may be accordary to certain diseases of the longs, such as employeems, chronic interstitial pneumonia, or chronic pleurisy, and it may be due to congenital malformation. Trocuspid insufficiency gives a systolic marmur, londest over the lower part of the sternum, but heard usually over a small area. It is associated with signs of dilatation of the right ventricle. The jugular usins stand out prominently, and often slow systolic pulsation, especially upon the right

side. There may be also systolic pulsation of the liver. The symptoms associated with tricuspid regurgitation are due to general systemic veneus abstruction.

Triscuspid stenosis, pulmente stenosis, and pulmente insufficiency are practically unknown in childhood except as engenital lesions.

Prognosis.—The danger to life in acute endocarditis is not great unless it is accompanied by pericarditis; but when both are present the author's serious. Of 125 fatal cases reported by Poynton, thirty-five proved fatal in the primary attack. It is difficult during the active stage to forstell bear serious will be the resulting durange to the heart. It is only by watching the progress of a case that one can decide. As a rule the younger the child the worse the prognosis.

Complete recovery from talvalar discuse is possible only when the lesions are very slight. Not many children die from chronic cardiac discuse before reaching the age of eight or ten years. Up to about the time of patients many children do very well; then they begin to lose ground, and may fail rapidly. But more often it is a fresh endoundities accompanying an intercurrent attack of rheamatism which marks the beginning of a downward course. The proportion of children who have serious cardiac lesions before the age of six years and reach adult life in good condition is very small.

There are several features of earline disease in children, in course quence of which serious lesions tend to progress more rapolly than in adults. The muscular walls are less resistant, and hence dilutation occurs much more readily in childhood than in adult life. 'The heart most provide not only for combant peeds, but for the growth of the body. If the patient's general nutrition is poor during the period of most rapid growth, this tells quickly and seriously men the heart, and dilatation makes rapid progress. The demands made upon the heart at pulerty are especially severe, by reason of the rapid growth of the body and the frequency with which anemia and malnutrition are seen at this time. There is always present the danger of rapid advances in the disease from intercurrent attacks of rheumatism, from which children are more likely to suffer than are older subjects. Extensive pericardial adhesions are frequent, and seriously handicap the hourt, greatly increasing the tendency to dilutation. The effect upon the heart of poor food, mahygicuic surroundings, and general mahustrition is much more marked than in adults.

These unfavorable conditions are in part offset by others in which the child has an advantage over the adult. Disease of the coronary arieries is very rure, and the valvular lesion which is most frequently met with—mitral insufficiency—is that which admits of the most complete compensation. In making a progressis in any given case, the amount of hypertrophy or dilatation which exists, and the presence or absence of percential adhesions are more important than the location or the special character of the manner. The presence of valualar disease in childhood increases the danger from every nearly disease, especially pertussis, diphtheria, pneumonia, and scarlet fever. The chances of recurring attacks of rheamatism must also be taken into account.

Probably the most important factor in the prognosis of chronic cardiac disease in childhood is the care and attention which the patient receives. While as a rule, if properly treated, these children do well among the well-to-do, they do very bailly among the poor where suitable protection and treatment is impossible.

Diagnosis.—Valvalar disease is to be distinguished particularly from conditions in which there are heard functional or acceleratal numbers. According to our experience the latter are very common even in young children. Mistakes usually arise from attaching too much importance to the presence of numbers, and too little to the changes in the walls and cavities of the heart, with which valvalar disease is almost invariably associated. It is not always possible to decide whether a number of organic or functional until the patient has been for some time under observation and treatment, particularly when anomia is possent. The diagnostic points, so far as the numbers are concerned, are mentioned in connection with accidental mornium.

Treatment.-The first and altegether the most important indication for every case of recent endocarditis is to secure for the heart an complete rest as possible, not only during the period of active inflammation, but for several succeeding weeks. The reason for this is that some dilatation is always present and this very readily increases. With children, preper rest can be secured only by keeping them in hed and in a recombent posttion. The duration of the period of rost after mild attacks of endocarditis should be at least six weeks, and after severe attacks, three months. In these young patients changes in the walls of the heart take place very rapidly and the gravest consequences are hable to follow a neglect of these precautions. In old cases rest is indicated during every nexts emerbition; also whenever there is much dilutation and little hypertrophy, and whenever the signs of failing compensation are present. In these other cases rest is often impossible in the recumbent position; if secured at all, it must be obtained with the child in the sitting posture or at least propped up with pillows. Whether much can be accomplished by the administration of anti-rheumatic remodes after endocarditis has developed is very doubtful. Salieylates or aspirin and alkalis may be used unless they disturb the stomach. A child who is the subject of a chronic valvular disease should be constantly under a physician's observation. Irrepurable harm often results from ignorant disregard of the simplest and most important rules of life for these patients.

Several distinct conditions may be present which call for quite different management. The essential points may be stated in a few words: For all recent cases and during all exacerbations, rest, complete and prolonged; for deformed values with good heart walls and perfect compensation, fresh air, moderate exercise, and general tonics; for feeble heart walls, failing compensation and distattion, rest and cardiac tenics.

During the stage of compensation, freatment directed especially to the heart is rarely necessary. The main purpose should be to maintain the patient's general nutrition at the highest possible point during the period of active growth. At the very least the patient should be carefully examined three or four times each year, in order that the physician may note the progress of the disease, and be able to direct the child's ednestion, occupation, energies, and surroundings so as to meet, as far as possible, the changing conditions. To this end, diet, sleep, study, and exercise should receive the most careful attention. If malautrition and anemia are allowed to go to unchecked until they become severe, the cardiac disease may make rapid strides, and as much harm be done in a few months as otherwise might not occur in years. The question of exereise and recreation is always a difficult one to settle. Often too little latitude is given, and the heart, like the voluntary muscles, loses its tone. Every form of exercise requiring a prolonged severe strain should be forbuilden, particularly eximming and competitive games, like ball and tennis, and others requiring much running; but skuting, rowing, horseback exercise, regulated gymnustics, and cycling on the level-all in moderation-may be allowed not only without barm, but with positive benefit; but any of these, used immoderately, may be productive of great injury. All exercise should be taken with regularity and system, the amount being carefully measured by the child's condition, and increased freedom allowed only after watching the effect. If the patient is a boy who must earn his own living, the physician should see to it that the occupation chosen is not one likely to make special demands apon the heart or to expose him unduly to conditions likely to induce rheumatism.

Special watchfulness is required at the time of puberty to prevent averpressure in schools, and the development of anemia. The first symptoms of these conditions should be treated energetically, and if the heart arems to be overtaxed the child should be put to bod. Those who are specially liable to rheumatic attacks should, if possible, spend the winter and spring months in a warm, dry climate.

In the stage of failing compensation, the same general conditions are present as in adults, and they are to be managed in pretty much the same way. When such symptoms are first seen, prelonged rest in bed should be insisted upon as the thing most likely to restore the normal conditions. Digitalis and straphantless are no ful in shildren with about the same indications as in adults, viz., dilatation, droper, low arterial tension, and weak pulse. They may be used in does of from five to ten drops of the tinuture every four to six hours for a child of ten years. If there is much dilatation of the right side of the heart the same treatment is indicated as described in pericarditis. One should be cardient about using digitalis for an irregular and overacting heart, epium being decidedly preferable under these conditions. An overloaded venous rireulation may be relieved by directive, by saline purgatives, or even by venescriben. Iron and tonica generally are indicated, particularly strycham and cod-liver oil.

MALIGNANT ENDOCARDITIS

Malignant or absentive endocarditie is rare in childhood. Among the youngest cases reported are one by Bond in an infant of two and a half months, and one by Harris in a loy four years old. In Bond's case the mitral valve was affected. The infection was with the B. proconcess. In Harris' case the right side of the heart was affected and the lesion was econdary to a congenital malformation. We have seen endecarditis of the mitral valve in an infant of six months following a servearthritis of the knee. Of the cases reported in early life, most have been in children over ten years of ago. Malignant endocarditis is never primary. It may be seen in any infections disease or septle process. In seventy-live per cent of the cases it is ingrafted upon a previous valsular discase. In the series of sollected cases of congenital mallermations of the heart, there were four deaths from malignant endocarditis, all but one, however, occurring in adult life. The bacteria most frequently conversed are the staphylacocous or streatococcus, next the pneumococcus, and rately the gonoeseeus, the inflaents or the programeus barillus.

Malignant endocarditis presents a great variety of symptoms, often making the diagnosis extremely difficult. There is generally a remittent type of fover, sometimes repeated rigors, sweating, low delirium, staper or come, and extreme prostration. There is often a fire petechial emption. Usually there is a cardine marmur, the location of which depends upon the seat of the disease; it is most frequently the murmur of mitral regargitation. It is sumetimes faint, and may be absent. From the embali there may result beniplegia, rapid swelling of the sphen, bloody arms or presuments. The disease lasts from three weeks to three mouths, death being the almost invariable termination. The most characteristic features of malignant endocarditie are the development of pyemic or typhoid symptoms with a peterhial erception, in a patient who has previously had talvular disease. Blood cultures in most cases give positive results, though not always early in the disease.

The treatment is symptomatic. The use of taccines has not met expectations; in the most acute cases no heardt has followed their administration, and even in the more prolonged types it is very doubtful if they have any value.

MYOCARDITIS

Disease of the muscular wall of the heart is rare in children, and of comparatively little importance, except in connection with acute undoand pericarditis and the acute infectious diseases. It is almost invariably secondary to some infectious process. Aside from the rheumatic conditions already considered the diseases which femish most of the cases are scarled fever and diphtheria. The most important local cause is pericarditis with adhesions.

Lesions.—In extra-uterine life, myocarditis as a rule affects chiefly the wall of the left contride, the papellary muscles, or the septum, but the entire organ is involved. The heart is of a grayish or yellowish-red, sometimes mottled solor, very soft, fruide, and flabby, and there is frequently dilutation of the cavities.

Two varieties of myocarditis are described, the parenchymators and the intenstitial. In the perenchymatous form there is a degeneration of the muscle fiber which, according to Romberg, is most frequently alborninous, next fatty, and least frequently braline. There is a loss of the transverse strictions, and there may be complete disintegration of the fibers. This process may be circumscribed, but it is usually diffuse. In the interstitial form the lesion usually occurs in small, circumscribed areas. There is an infiltration of round cells, chiefly menounclear, between the muscular fibers of the heart. The process, when neate, may result in absorption or in the production of small abscesses. In chronic cases it may lead to the formation of areas of dense connective tissue resembling contrices, in the heart wall. Either the interstitial or the parenchymatous form may occur alone, but in most of the scute cases they are combined. In addition, there is usually some degree of anural endocarditis and inflammation of the pericardism pext to the heart wall. Dilatation frequently follows. Cardiac ancurion and even rupture have been known to occur in a child of six years (Hadden's case).

Symptoms.—In many cases in which advanced belons have been found at autopey there have been no symptoms appropriated during life. Careful examination of the heart, however, will usually show an altern-

tion in the first cardiac wond, the muscular quality diminishing and the valcular quality increasing. This may go on even to a total disap-pearance of the muscular quality and only a flapping valvular sound may remain. The first and the second sounds are then almost alike. In such severe cases diastale is relatively short and the rhythm is much like that of fetal life. A systalic morning due to dilatation of the auriculoreptricular ring, or to imperfect action of the papillary muscles, may be heard at the apex. The heart is usually slightly diluted, but may be excessively so. Its action is generally increased in rapidity and may be irregular; a show heart, 50 to 70, with feeble, valualar sounds is less frequent but very characteristic. The apex beat is diminished in intensity and the pulse is soft and weak. The blood pressure is low, frequently 60 mm, or even less. Other symptoms may be present that are dependent upon feeble heart action-pallor, dyspness, slight crancers, and attacks of syncope. Less frequently there may be dropsy of the feet or the serous cavities, and scanty urine semetimes containing albumin. Death may secur suddenly from cardiac paralysis or gradually from circulatory failure. Becovery may take place after alarming symptoms have been present, these slowly absting. It may be many weeks before the normal cardine sounds are beard.

Treatment.—This is mainly symptomatic. After severe attacks of those infectious discusse in which myocarditis is liable to occur, and at any time when it is anspected, patients should be kept recambent for several weeks, and special care correised to present any sudden exertise, as death has resulted from so slight, a thing as suddenly sitting up in bed. Once definite symptoms have developed, absolute rest is impensive. Much more is to be expected from complete rest than from draps, which as often employed may do positive harm. Digitalis should be used with caution, and never in large doses. In some cases with symptoms indicating imminent heart failure rather striking benefit has followed the use of morphin hypodermically.

ACCIDENTAL MURMURS

Under this term are included these marmors that do not depend upon organic change in the heart or are not functional in the sense that actual regurgitation takes place through a dilated prince.

In early life such murmors are exceedingly common. Our seu observations confirm these published by Hamill and others, that numbers may be heard on careful examination in nearly fifty per cent of all children. Their existence is often a cause of much needless anxiety and of many unnecessary restrictions of a child's activities. They are almost invariably systolic in time; they are usually of runderate intensity, soft and blowing in character, and are not transmitted. They are unaccompanied by changes in the size of the heart or by symptoms referable to its function. They are upt to be inconstant in occurrence, and often change in character or disappear altogether by changing the posture of the child.

The exact method of their production is still a matter of doubt. In certain instances they are apparently dependent upon changes in the blood occurring in anemia. In several of our patients, infants with grave anema, quite load nurmars have disappeared after transfusion. In other cases there can be no doubt that the marmors are produced in the lungs, air being forced through the broarhi by the movements of the contracting heart. The term cardropulmonary is applicable to murmurs of this origin. This nurmar is not load, as never heard to the right of the stermain and disappears when the breath is held. It is annulty loadest over the pulmonary aftery, intensified by excitement or exertion, and often disappears when changing from a standing by a supine position.

Atonic nurmors are probably due to lack of tone in the cardiac rausele leading to a real but temporary insufficiency, usually at the mitral orifice. These nurmors correspond in most cases to a slight mitral regurgitant nurmor. They are beard in the course of a number of acute febrile diseases—netably scarlet and typhoid fevers; also in many pule, delicate, nervous children, especially between the ages of eight and fourteen years.

Anemic marmore are usually accompanied by a venous him, but not by an accentuated pulmenic exceed seems. Other causes of accidental rearmore such as a functional stenosis of the pulmonary artery and infundibulum, functional metral insufficiency and oddy currents within the ventricles are not so well substantiated by clinical or experimental peool.

Probably the most frequent of all accidental nurmars is the soft systolic nurmar which is heard over the body of the heart near the loft berder of the steraum at about the nipple level; it is increased by placing the child on his back and in many patients is heard only in this position. This nurmar is usually intensified by overaction of the heart whether due to excitement, exertion or fever. It is accompanied by no symptoms referable to the heart or circulation and it may be net with in children who are in perfect health. This nurmar is more often heard in infants and young children, but may be present for many years. It is often confused with nurmary due to cardiac mulliconuttion, but it is not loud as are they, and is heard only over a localized area.

The differentiation from murmurs due to organic cardiac disease

may be difficult and only possible by continuous observation for some time; but in any infant or child one should hesitate to make a diagnosis of congenital or nequired organic disease from the mere presence of a soft systelic nurmen.

FUNCTIONAL DISTURBANCES OF THE HEART

Disturbances of the heart's action unconnected with organic disease are quite common in children, especially from the seventh or eighth year up to puberty. Common causes are disorders of digestion, the excessive use of tex, coffee or tobacco, especially in the form of cigarette smoking, metnia, over pressure in schools or other conditions leading to nervous exhaustion. The exciting cause is sensitimes a great emotional disturbance such as fright or excitement, or it may follow any serious acute illume. As a rule there are more subjective symptoms with functional than with organic disease unless the latter is advanced. Functional disturbance may take the form of attacks of palpitation, tachycardia, bradycardia or arrhythmia.

With attacks of pulpidation there may be a sense of oppression in the precordism; there may be some dyspace or even orthopnes; the pulse is generally rapid, often slightly irregular. There is strong pulsation of the caretide and semetimes bendache or vertige. There may be cold extremities and general perspiration. The duration of the attack is from a few minutes to several hours. The treatment is that of the general nervous condition upon which the pulpitation depends.

Tachycordia (napid heart) occurs in certain susceptible children from slight cause, most frequently when the general health is below par, in conditions of anemia, and in nervous children—particularly girls about the time of puberty.

In the same patient the symptoms may occur at intervals for years. The pulse at such times may be from 120 to 160 per minute or even more rapid than this. The condition may persist for days or weeks at a time, then subsiding, but the symptoms resurring at variable intervals. In some children a very rapid pulse must be considered an idiosyncrasy.

In a patient with an attack of inchycardia position makes little difference with the heart rate. Sometimes it is even more rapid when the shild is recumbent. It is, however, almost invariably much lower during sleep and at such time may even be quite normal. The rhythm of the heart is not disturbed. It is important not to confound this condition with Graves' discuss. The treatment is to be addressed to the hervous condition present, to which as a rule the cardiac symptom is secondary. In certain children there is seen a more rare but severe form of this condition known as paragraph to beyond in the best observed in children as young as three years. There develops abruptly and withsut assignable cause an extraordinary heart rate which may be 200 to 210 per minute. Such attacks may last from a few minutes to several weeks, both beginning and ending abruptly. After an attack the pulse may for a time be abnormally slow. In prolonged cases some cardiac dilatation often occurs, and a systolic marmor may develop. Serious consequences may follow, such as swelling of the hiner, dropsy, etc. The cause and mechanism of such an abnormal cardiac stimulus are as yet obscure. Currously, attacks may often be cut short by comiting. The indications for treatment are zervous solatives, complete rest and prolonged treatment with digitalis in full doses.

Bradycardia (slow heart) is a much less frequent condition than tachycardia. It is seen in a variety of pathological conditions not involving the heart, such as jaundice, certain poisons, etc. Its persistence in young children is always a suspicious symptom suggesting cerebral discase, though in some children an abnormally slow pulse is an idiosyncrasy. Existing by itself, no importance is to be attached to it as a sign of cardiac disease.

Arrigithmia.—Like all other nervous adjustments the heart-regulating mechanism does not work with the same undomnity in children as in older subjects. In consequence of this, disturbances of cardiac rhythm are more frequently seen and occur from slighter causes in early life than later. Cardiac irregularity is exceedingly common in children, and is often seen in those who are apparently in excellent health. Of 321 unselected children studied by Friberger only 37 per cent had a fairly regular pulse, while over 12 per cent had a very irregular pulse. A certain degree of cardiac irregularity up to the time of puberty is so common that it must almost be regarded as the rule. Only exceptionally does it indicate disease of the heart; particularly is this the case when it occurs with slow heart action. The higher forms of irregularity are usually seen in younger children. In general, it is more often observed in girls, but is not affected by general development nor by cardiac weakness. It is slightly more frequent in nervous subjects.

Sinus arrhythmia, reflex ambythmia or, as it is sometimes called, tagus irregularity, is the characteristic type of arrhythmia in early life. The alteration in cardiac rhythm is brought about by stimuli which arise outside of the heart and reach it by one of the cardiac nerves. The point of origin of the impulse is probably the sinus region. Reflex stimuli are constantly reaching the heart. The regulation of bents is usually so perfect, however, that they do not influence its rate. If the resistance to outside stimuli is less than normal these stimuli may reflexly affect

the rate. It has been shown by Einthusen and others that stimuli pass up the vagus naives with each responsion. The servous control of the various functions of the body is imperfectly developed in children and some arrhythma as in them a frequent finding. It bears, in many instances, a close relationship to the respiration. The irregularity is generally but not always shown in the pulse at the senst. It is best determined by assemblation. The irregularity is often rhythmical, varying with the respiration. With impiration, the action of the heart becomes rapid and with expiration slow. Other varieties are, irregular purses or a varieties retainlation of frequency at irregular intervals.

There are no subjective symptoms and the patient is seldom conscious of the condition. The arrhythmia is present during sleep, eften most marked at that time and associated with orientar respiration. A diagnosis of sinus arrhythmia is made chiefly by its association with respiration; it disappears with rapid respiration or when the breath is held. It is also characteristic of this condition that it is seen only with a slow heart action, disappearing at once when the heart's action from may come becomes rapid.

This form of irregularity is not in itself significant. It is not a symptom of cardiac disease, nor does it affect the patient's health or his development. It may safely be ignored altogether. In certain children, however, it may be a constant phenomenon and may persist for many years. Sinus arrhythmia may be not with as a temporary condition after any severe scute illness; it may be seen in children of the neura-thenic type associated with other wrideaces of nervous instability. In many cases, even of the most pronounced type, no adequate some can be discovered.

Another type of irregularity is due to the production of safez sudoles. These are recusional, irregular beats caused by single absormal stimuli, arising within the heart, either in the suricle or ventricle. Extra systoles are selforn observed in young shildren,-more frequently in those over eight or ten years old. The extra systoles may be followed by a long punse the following normal leat being emitted, or two beats may occur very close together. Extra excludes are usually not sufficiently forcible to open the nortic valves. For this reason they cannot often be felt at the wrast but may, in thin subjects, he recognized by palpation and they can be determined by assemblation or tracings. There may be no subjustive symptoms or there may be complaint of precordial anxiety and unrest when the extra systoles occur. This form of irregularity is solden a constant phenomenon, but with exceptible persons it comes and goes from apparently elight causes. It is most marked when the pulse is slow and may disappear when it becomes rapid, sometimes also on assuming a recumbers position.

Extra systoles are usually not associated with other signs or symptoms of cardiac disease in children and under such circumstances may be practically ignored. The condition is not a serious one. Its causes may be disorders of the stomach, an extremely sensitive nervous system, or convalencence from an acute februle disease, especially preumonia. The treatment should be addressed to the general condition, not to the heart. Exercise need not be restricted.

DISEASES OF THE BLOOD-VESSELS

Coarctation of the Arch of the Aorta.—This is a rare congenital beion in which there is a partial or complete exclusion of the aorta at at near the junction with the ductus arterioses. The ductus may remain patent and the systemic circulation be carried on almost exclusively by means of the blood which passes by way of the ductus from the pulmonary artery to the norta below the constriction. Coarctation of the arch may be the only lesion or there may be associated lesions with death in the first few months. When the stenous is beyond the opening of the ductus arteriosus a very complete collaboral circulation develops chiefly by means of the superior intercostals and mammany arteries alove, and the nortic intercostals and superficial and deep epigastric arteries below. In consequence of this there may be no symptoms of the condition. Instances are on record where persons with this lesion have fixed to advanced age, but often they are stunted in growth, poorly neuroshed, and complain of dyspnea.

The physical signs are at times very characteristic. The collateral streakation may show superficially over the thorax and upper abdomen. A marked disproportion in intensity between the radial pulse and the femoral pulse may be present. There is frequently marked pulsation and a thrill in the supresternal notch owing to dilutation of the arch of the norts. A lond systolic marmor may be heard in the second or third spaces on the left side, well out from the sternum. Death may be due to intercurrent disease, to failing circulation and sometimes to rupture of the heart or of the arch of the arcts.

Abnormally Small Arteries (Arterial hypoplasia).—This condition is not a common one. The only thing which is abnormal in the circulatory system may be that the north, and sometimes all the large sensels are only two-thirds or three-fourths their usual califor, or even loss. This may interfere seriously with the growth and development of the body, especially of the general organs, although this result is not a constant one. The condition is found occasionally in cases of thioresis. There is sometimes associated a certain amount of hypertrophy of the heart. The other symptoms are anomia, and sometimes an imperfect

development of the body. A positive diagnosis during life is impossible.

Ansurism and Atherems.—In early life chronic discuss of the bloodvessels is exceedingly rare, yet a sufficient number of observations have been recorded to show that even young children are not except from this form of disease. Sanné records the youngest case, which occurred in a fetus born at about the eighth month, in whose body there was found a large aneurism of the abdominal acrta just below the origin of the renal arterios. Le Bentillier has collected seven cases of thoracic aneurism in children under ten years; the arch of the acrta was the usual seat.

Probably the most important chological factor, as in adult life, is syphilis, but in only a few of the cases reported was the evidence of syphilis conclusive. In two cases there was general tuberculosis. In at least two cases whooping-cough appeared to act as a contributing cause. Anomium may also be due to some local condition, such as an erosion from a bony growth, an abscess in the neighborhood, or to embelsen. The symptoms and course of ansurism in young children do not differ essentially from those of the disease as seen in adults.

In addition to the cases of ansurism referred to above, we have found reports of seven cases of atherona in very young subjects. In Sanné's case the patient was but two years old, and patries of atheronatous degeneration were found in several places in the north. In Hawkins' case, there years old, there was found extensive atheronatous disease of the north, subclassian and carotial arteries. In Filatow's case, atheromatous degeneration affected the arteries at the base of the brain, causing fourth from cerebral hemorrhage. It is interesting to note that in this patient, who was only obvious years old, there was also present chronic diffuse replantic with contracted kidneys. A similar condition of the kidneys and arteries was observed by Dickinson in a girl of six years. We have seen extensive arteria-selerosis the result of hereditary syphilis in a bay of five. Death occurred from hemorrhage into the lateral ventricle.

Embeliam and Thrombosia.—Embeliam is very rare in early life, even with scate endocarditis. The embeliance usually swept into the circulation from regetations upon the valves of the heart. The symptoms which they produce will depend upon the nature of this embeliand the ressels occluded by them. If they lodge in the brain they may cause paralysis or convulsions; if in the spleen, pain and swelling of this organ; if in the kidneys, pain, tenderness, and conctimes hematurus; if in the lungs, cough, sometimes accompanied by hemophysis and occasionally by a sharp thoraric pain. If the embeliance infections, they may give rise to abscesses. The pathological results following embelian are similar to those which are seen in adults.

The most frequent form of thrombons, that occurring in the amove of the brain, is discussed in connection with Discusse of the Nervous

System. Cardiac thrombi, especially of the right side of the heart, are not infrequently found in patients dying from cardiac disease, preumonia, and occasionally also from other sente inframmatory processes and acute infectious diseases, particularly diphtheria. These thrombi are in most cases produced during the last few hours of life, or just at the time of death, and are of no clinical importance. They frequently extend from the heart into the large blood-vessels, particularly the pulmonary artery. Thrombosis occasionally occurs in any of the large vascular trunks in childhood as well as in pluit life.

Thrombasis of the Internal Jupalar Vein.—M. Pasteur has reported a case in a child two and a half years old, in which the middle of the vein was filled with an organized thrombus, and the lower portion obliterated and reduced to a fileous sord. The symptoms were swelling, edema, and cyanosis of the face, and dilatation of the facial vein, but not of the external jugular. There were elabbing of the fingers and edema of the feet, but not of the arms. The heart was dilated and hypertrophied, but there was no valvular disease. The symptoms had existed since an attack of pneumonia, eighteen months before death.

Thrombasis of the Yenz Care.—Quite a number of cases are on record where this has occurred as the result of pressure from large abdominal tumors; it has followed new growths of the kidney and large masses of tuberculous lymph nodes. Neurotter and Salmen have recorded a case of thrombosis, apparently of marantic origin, in a child seven years old. The thrombus filled the tena cava, and extended to the arigin of the hepatic veins and into both femorals. Death occurred from tuberculosis. In Scadder's case (seventsen years old) there was apparently obliteration (probably congenital) of the inferior vena cava; there was an extensive variouse condition of all the abdominal veins. The symptoms of threenbosis of the vena cava are swelling and edema of the feet—sometimes of the abdominal walls and the groin—and very great dilutation of the superficial abdominal veins.

Thrombesis of the Aorts.—A case has been reported by Lespold in a newly-born child who was delivered by version. The thrombus was of recent origin, and filled the lower aceta, extending into the femoral artery. A case of thrombesis of the aceta occurring in a girl of thirteen years has been reported by Wallis. The zorts was very narrow, and probably the sent of syphilitio disease. The thrombus extended from the origin of the renal arteries to the celine axis.

Thrombous in Infectious Diseases.—There is occasionally seen in typhoid fever, but more frequently in diphtherm, thrombous of some of the large venous trunks, usually of one of the lower extremities. The symptoms are pain, localized swelling, and partial paralysis. If the artery is affected, there may be gangrene.



SECTION VI

DISEASES OF THE UROGENITAL SYSTEM

CHAPTER I

THE URINE IN INFANCY AND CHILDROOD

Where a study of the urine is of much less importance in early life than of the symptoms referable either to the digestive or respiratory system, it is deserving of much more attention than it has generally rereised. In infancy especially it is attended with some difficulty, owing to the fact that it is by no means an easy matter to seeme readily specimens for examination.

Methods of Collecting Urine.-In male infants this may be done by placing the penis in the neck of a small bottle or test tube which lies between the thighs, and is secured in position by pieces of tape passing over the hips and beneath the perincum. The urine of female infants can sometimes be collected in a similar way by placing a small cup or a largemouthed bottle over the vulva and holding it in place by the napkin or by pieces of adhesive plaster. A plan often successful is to put the infant upon a chamber after a long sleep. It should be done at the instant of waking or the child may be wakened for the purpose. When an infant has not voided for one or two hours the application of a celd hand or a rieth wrang out of ice water to the abdomen or the buttacks will usually cause emptying of the Idadler. A small amount of orine, sufficient to test for albumin, may often be obtained by placing absorbent cotton over the valva or penus. The most certain of all means, however, is catheterinition, which, however, should not be resorted to unless absolutely necessarr. A soft-rubber catheter, site 6 or 7, American scale (9 or 11 French), should be used for infants.

Daily Quantity.—This is relatively much larger in infants than in older children and in adults, on account of the large amount of water taken with the food. The quantity fluctuates widely from day to day, according to the amount of fluid food taken and the activity of the skin and boxels. The figures following are the averages obtained by combining the results of the investigations of Schabanows, Cruse, Camerer, Polisk, Martin-Ruge, Berti, Schiff, and Herter.

Average Dutly Quantity of Urans in Health.

Aan	Grana	Dunces.	
First twenty-four hours Second Isenty-four hours Three to six days Seron days to two morths. Two to six souths Six magnits to two years. Two to first years. First to eight years. Eight to furthern years.	258 * 900 200 * 500 600 * 1,300	0 to 2 36 * 3 3 * 4 5 + 13 7 * 16 8 * 20 20 * 40 32 * 48	

Prequency of Micturition.—Thus is greatest in young infants, and dominishes stendily as age advances. In infancy, during the waking hours, the urine is passed very frequently, often two or three times as hour, while during sleep it is retained from two to six hours. By the third your the urine may be held during sleep for eight or nine hours, and at other times for two or three hours. Such control of the sphine-ter of the bladder is often obtained at two years, and sometimes even at an earlier period. From slight nervous disturbances or minor ailments of any kind, this control is impaired, and the arine may be passed by children of four or five years with the frequency seen in infants.

Physical Character and Composition.—The urine of the newly born is recally highly colored. During later infancy it is pale and frequently furbid, even when practically normal, awing to the presence of mucus; this includity often no amount of filtration will entirely remove. Less frequently the turbidity depends upon urates. The urine of the first few days of life often shows a deposit of urates so uric acid in the form of a pink or reddish-yellow stain upon the mapkin. The reaction of the urine at this time is usually strongly acid, but throughout the rest of infancy it is faintly acid or neutral.

The specific gravity is higher during the first two days than at any time in infancy on account of the scanty supply of fluid taken; it is usually lowest from the third to the sixth day, but from this time it rises steadily until puberty is reached. The specific gravity varies with the quantity. From the writers already referred to, the following figures are taken:

	Specific gravity.	
First to third day	1.010 to 1.002	
Fourth to teath day	1.004 * 1.005	
Teath day to sixth menth	1.004 * 1.003	
Six months to two years	1.000 * 1.002	
Two to eight years	1.008 * 1.005	
Eight to fourteen years.	1 012 - 1 020	

Microscopically, the urine of the newly born shows the presence of many squamous epithelial cells, macus, granular matter, crystals of urio acid and amorphous or crystalline urates and amorphous bilirabin crystals which are insoluble in urine not containing bile acids. It is not uncommon to find hyaline and even granular casts. Martin-Rage found by aline casts in the urine of fourteen out of twenty-four healthy nursing infants examined during the first work. Granular casts were much less frequent.

The inorganic salts (phosphates, chlorids, sulphates) are all present in the urine of the newly born, but in relatively small quantities, increasing as age advances. The reloring matters are also less abundant.

Albumin is often present in the urinc during the first days, but usually in small amount. Crose found it twenty-eight times in ninety observations upon healthy infants; usually the quantity was small, amounting to traces only, but in two cases it was quite large upon the second day. These observations are confirmed by the investigations of Martin-Ruge, and also of Pollak.

Sugar is frequently found in the prine of healthy infants during the first two months. It may be made to appear an the prine of healthy infants by simply increasing the quantity ingested. The different angars vary as regards the amount which can be taken before it is thus eliminated. According to Gréez, lacture appears if the quantity is increased to three or four grams per kilo, of body weight; gincose, only when five grams, and maltose, not until seven and seven-tenths grams per kilo, are given.

LORDOTIC, ORTHOSTATIC OR CYCLIC ALBUMINURIA

This condition, although uncommon in young children, is frequently seen between the ages of six and lifteen years. It is much more common in males than in females. A recurrent but benign albuminaria in children has been recognized for many years and has been referred to numerous causes such as cold bathing, fatigue following muscular exertion, dyspeptic conditions or a diet rich in nitrogenous food. It is dealeful if any of these are of etiological importance, for the condition persists when their influence is entirely eliminated. The most important factor is undoubtedly a rechanical case. The albuminum is due to the upright position. When this is not assumed there is no albuminum, or the merest trace. There can also be no doubt that lordous plays a very important part, if not the most important part. The majority of cases occur in children with a considerable degree of lordous. How this acts, by producing congestion of the kidney by pressure on the vessels at the pelvis or otherwise is not quite clear.

Symptoms.—Some of the patients exhibiting orthostatic albuminums are well nourished and have no other signs of disease; the majority, however, while they may be considered healthy, are not vigorous. They

are renally aremic and rather poorly neurished. They suffer from gastro-intestinal symptoms of which constipution is a frequent one and often have headaches and various neuroses. Cardiac palpitation and tasomotor symptoms are common. The trunk is usually long in proportion to the height and a degree of levelosis is the rule. The abdomen is notally prominent. Sometimes symptoms of angioneurotic identa have directed attention to the urine. Except for these there are no symptoms that would direct attention to the genito-urinary tract and the condition is notally discovered in an attempt to explain the poor general condition of the patient.

The arine is usually clear and that which is secreted while the child is lying down presents nothing abnormal. Shortly after assuming the upright position albumin appears in greater or less quantity. This is serum albumin plus a substance which is precipitated by acetic acid in the cold. Becent studies have shown that this is probably chardreitin sulphuric acid united with serum albumin. The amount of albumin present may vary from a trace to 50 per cent by volume or even more. The substance precipitated by acetic acid is never in large quantity. It causes clouding of the urine or an appreciable precipitate but no more. It is sometimes found above and always when serum albumin is present. The assumption of a markedly loudotic position increases greatly the amount of albuminum. Infrequently costs may be present; they are usually hyaline easts and few in number. They may occasionally be associated with a temporary glycouria but the kidney does not alow a greater permeability to other substances used for renal tests. Evidences of nephritis, high arterial tension, capting hypertrophy, etc., are about.

Orthostatic alluminuria is not a dangerous condition, nor does it interfere with bealth. It disappears usually at or shortly after pulserty. Occasionally it may persist well on into adult life.

It is important that orthostatic albuminums should not be confused with nephritis. Children are not infrequently confined to bed for a long time and placed upon a rigid diet with the mistaken idea that nephritis is present. If, after repeated examinations, it is found that albumin is present only when the apright or lordeter position is assumed, if a substance precipitable by acetic acid in the cold is present and other exidences of nephritis absent, the diagnosis of orthostatic albuminums may properly be made.

Treatment.—If lordosis is present, as is usually the case, much can be done to prevent the albuminuria. The abdominal muscles should be strengthened by appropriate gymnostic exercises. The children should practice assuming and maintaining a proper position in standing and setting. Exercise is of value but prolonged standing should be avoided. If the lordosis persists in spite of these measures a light form of apparatoo may be worn which prevents the lordotic position but does not interfere with exercise. Associated conditions such as memia, constipation, and the various neuroses should receive their appropriate treatment.

HEMATURIA.

Hematuria is characterized by the presence of red blood-cells in the urine, and is to be distinguished from homoglobinuria where only blood pigment is present.

Hematuria may result from local or general causes. In infancy it may be due to new growths of the kalney. Such hemorrhages, though rare, may be abundant, and may be seen early. Hematuria may occur also as a symptom of neute nephritis, especially that complicating scarlet fever, or it may result from the irritation of a calculus in the kidney, the ureter, or the bladder. In rare instances its cause is a new growth of the bladder, and it may be due to tranmatism. It may sometimes be produced by the irritation of a highly concentrated urine, owing to the fact that too little fluid is taken. We once saw a marked exemple of this in an infant eight months old, when no other explanation could be found. Hernsturia is occasionally seen following uniousid infarctions in the newly born. It may also occur at this age no one of the symptoms of sepsis. Among the general causes the most important are, the hemorrhagic disease of the newly born; the blood discressive, such as scurvy, pursum, and hemorbilia, and infections diseases, particularly typhoid, scarlet fever, influence, and malaria. In most of these cases the amount of blood passed is small. When it is large it may appear in the urine as clear blood, or as clots, or it may impart simply a reddish or smoky color to the urine. The rolor, however, is not so reliable as a microscopical examination.

Large homorrhages are much more likely to come from the kidneys than from the bladder. The presence of blood casts from the renal tubules, or larger ones from the ureter, are conclusive evidence of the renal origin of the homorrhage.

The treatment of hematuria should be directed to the cause upon which it depends. In infancy scarvy especially should not be overlocked.

HEMOGLOBENURIA

In this condition blood pigment appears in the urine in large quantity, but red blood-cells are very few in number or are absent altogether. In severe cases the urine may be almost black. There is commonly a

small amount of albumin. This condition may be recognized by the appearance of granules of pigment under the microscope, or by Heller's test; the most conclusive means of diagnosis, however, is by the spectroscope.

Epidemic hemoglobinuria (Winckel's disease) has already been described in the chapter on Diseases of the Newly Born. Hemoglobinuria may be due to certain poisons, as carbolic acid or chlorate of potash, or to certain infectious diseases, as scarlet lever, typhoid fever, malaria,

syphilis, or eryslyclas.

Paracysual beneglebinuria occurs in childhood, although it is an excellingly rare condition. In most of the recorded cases there has been a history of syphilis and the Wassermann reaction has been positive. It is now regarded as a syphilitic affection. Paracysms may be excited by suposure to cold, by chilling the surface of the body or by merely immorning the hands in cold water. Vagorous antiluctic treatment is indicated. It is not yet clear that it is always entirely successful; it may, however, greatly supprove the condition. For further description text-books on general medicine should be consulted.

PYURIA

Pus in the urine may exist as an neute or a chronic rendition. In either case, in a child, it is much more likely to come from the pelvis of the kidney than from any other source. It may, however, some from any part of the genits-urinary tract—the kidney or its pelvis, the ureters, the Madder, the weethra, or the vagua. Sometimes it comes from an outside source, as when an abscess from perinephritis, appendicitis, or carries of the spine opens into the urinary tract.

Coming from the pelvis of the kidney, pus may indicate, if the condition is an acute one, pyelitis, pyelonephritis, or pyonephrosis; if it is chunic, it may point to renal tuberculosis or calculus. The amount of pus in any of these conditions may be quite large. The mine is turbed and usually seid in reaction. It contains many epithelial cells of the transitional variety. A write containing much pus is always albuminsus. It is more that pus comes from the unsters except in connection with congenital mulformations or the impaction of calculi. Pus from the bladder is not usually in large quantity, and may be mixed with muchs. The urine may be alkaline or arid in reaction; there may be associated the symptoms of renical irritation or of cystitis. Pus from the lower genital tract is rare in children, and its causes may often be recognized by a local stamination. When the sause of pyuria is the opening of an aboves into the urinary tract there is generally a sudden appear-

ance of pus in large amount. The pyurin is usually in such cases of short duration, possibly only a few days, and it may disappear quite rapidly.

The nature of the infection can be determined only by cultures made from a catheterized specimen. This information is of considerable aid both in diagnosis and prognosis.

The treatment of pymria depends altogether upon its cause. Improvement in the symptoms numetimes follows the use of hexamethylenamin, which may be given in doses of from five to ten grains three times a day to a child of five years.

ANURIA

By this term is memt an arrest of the torinary secretion. To that form which occurs in the course of renal disease the term "suppression" is generally applied. Amuria is to be carefully distinguished from refention, from the scartly secretion which occurs whenever food is refused or withheld on account of illness, and also from that which accomvanies acute diarrhea, with large, watery discharges. Anuria is sometimes seen in the newly born, where it depends upon some malformation of the penital tract; or, more frequently, upon wric-scal infarctions in the kidneys. The first urine passed after such an attack is very eften highly acid, and may contain an abundance of urie-acid crystals and larger masses visible to the naked eye. Other cases admit of no such explanation. For the time, the secretion appears to be completely arrested, as the blackler, both by palpation and catheterization, is found to be empty. This condition is very uncommon in infancy, and it may contimue for from twelve to thirty-six hours. So long as infants appear to be perfectly normal in goery other respect, the suspension of the urinary secretion even for twenty four hours need excite no anxiety.

The treatment consists in the administration of the acetate or citrate of potash, and plenty of water. To a newly-born infant one grain of the citrate of potash may be given every hour or two, in water, until the urinary secretion is astablished, which will usually be in six or eight hours. If the urine is very highly next and stains the napkins, the potash should be continued for several days. Hot fomentations over the kidness may be used.

DIABETES INSIPIDUS (POLYURIA)

This is a chronic disease characterized by the exerction of a very large amount of pule urine of low specific gravity. It is invariably accompanied by polydipsis. The disease is a rare one in shidten.

Etialogy .- Of eighty-five conve collected by Straum, twenty-one were in children under ten years of age and nine under five years. In Roberts's collection of seventy cases, the disease began in twenty-two chiledrep before ten years, and in seven during infancy. In some cases it begins soon after birth. Males are more frequently affected their females, and in certain cases heredity is an important factor. Well has published a remarkable example of the disease existing in many members of a single family. Falls or blows upon the head, concussion of the brain, tumors of the brain, and chronic hydrocephalms, all have been found assecusted with diabetes incipidus. It sometimes has followed the acute infections diseases; but in many cases no cause whatever can be found. The association of diabetes instead in with besions at the base of the brain has long been observed. More recently this symptom has been connected with losious of the pituitary body. Smort one of the most frequent lesions of the base is chronic syphilitic meningitis, syphilis must be considered a possible etiological factor. It is altogether probable that a number of quite distinct causes may produce dialetes insipodus.

Symptoms.—The quantity of urine is enormous, usually exceeding even that in diabetes mellitus. From five to twenty pents daily may be passed. The urine is puls, the specific gravity from L001 to 1,000, and it contains neither albumin nor glucose. In a few cases the presence of inesite (muscle sugar) has been found. Restricting the amount of fluid taken causes a very marked diminution in the amount of urine. The intense thirst leads patients to drink enormously of water and other fluids.

Nervous symptoms are insually present. There may be disturbed sleep from the frequent micturition, pulpitation, flushing of face and other suscenter disturbances, headache, restlements, and neuralga. There may be incontinence of nrine. The bladder sometimes becomes enormously distended. In one of our cases it hold forty-five ounces and reached above the umbilious. The skin is pale and dry, and perspiration is scanty. The general health may not be much disturbed. In most cases, however, it is affected, and there may be the usual symptoms of malnutrition, and even neurasthenia. If it affects young children, their growth is generally retarded. The appetite usually remains quite good lest anorexia may be marked. The temperature is at times slightly subnormal. The course of the discuss is indefinite. It is very clausic, and may last for many years, death taking place from intercurrent after-

Prognosis.—Occasionally a patient will recover spontaneously. Of the chronic cases in which the disease is well established very few are controlled. The progness is especially led if there are marked disturbances of the digestive tract or organic brain disease. Diagnosis.—This is easily made from the two marked symptoms, excessive thirst and polyuris. From diabetes mellitus it is easily distinguished by the lower specific gravity and the absence of sugar from the urine. In older children, chronic nephritis with contracted kidney may be confounded with it. Its occasional association with syphilis should be remembered and a Wassermann but made as a possible basis of treatment.

Treatment.—Fluids should be understely restricted. It is a serious mistake to reduce the quantity of fluids too much, since the drinking is not the cause of the diarests. The doct should be simple and nutritions. The general freatment should be directed to the condition of malnutrition. The clothing should be warm, and a moderate amount of exercise should be allowed. Drugs, in most cases, are of little use. Beyonids and belladenna continued for many menths are claimed to be of value. Codein too is said at times to cause decided improvement. It is doubtful if the prospect of care justifies its use for a prolonged time. Treatment must be continued for many menths to be of any value.

CHAPTER II

DISEASES OF THE KIDNEYS.

MALPORMATIONS AND MALPOSITIONS

Magromations of the kidney are not infrequent. In seven hundred and twenty-six consecutive autoposes at the New York Infant Asylum malformations of the kidney or unsters were not with in seventeen cases. This does not represent the actual frequency with which they sever, for in about half that number of autoposes in two other institutions only a single example was seen. Adding to the cases mentioned two others seen elsewhere, there are twenty cases of renal malformation of which we have notes, classed as follows:

Fusion of the kidneys, or burseshoe kidney	4	(1887).
Supernumerary unders	3	W.
Hydronephrosis (alone)	8	.00
Congenital cystic kidney (alone)	2	**
Hydronephrous and systic kidney	1	CARS.
Single kidney	1	366

In all malformations the left kidney is much more frequently affected than the right, the proportion being nearly two to one. Malformations

are more often seen in males than in females. Only two of these conditions are of clinical importance—via, systic degeneration and hydronephrosis.

Cystic Kidneys.- Two varieties of this mulformation are met with. In one the cycle are lew in number and large; in the other they are very comerous and small. When the costs are large the renal terror may fill the abdominal cavity, even interfering with the birth of the child. The rendition is generally bilateral, and the patients die in early infancy. The more common form, that with small cysts, also affects both sides as a rule. The organ often a not enlarged, and it may eren be smaller than normal. The surface of the hidner is studded with small cysts, which usually vary in size from a rou's bend to fluit of a pea. The entire organ may commist of nothing but a mass of cycle, held together by loose connective tions. In other cases the cysts are less numerous, and much renal tissue remains. The spets are formed by the dilutation of the urindersus tubules awing to seclusion, which secure in the development of the kidney. The large cysts are recognized as abdominal tumors; the small ones usually give no symptoms during infancy and childhood and are found accidentally at autopay in patients dying from other diseases. In either form uremic symptoms may develop if an insufficient quantity of functionating rotal substance remains.

Hydroxephrous.—This renal lesion in a mild form is not very uncommon at autopsy when no physical signs or symptoms have been given
during life. In more severe form it is associated with many of the malformations of the organ such as borseshoe kidney, cyclic kidney, etc. It
may affect one or both sides and be found in both males and females.
Hydroxephrosis is undestitedly the result of some obstruction to the outflow of urine from the kidney, under or bladder, but this obstruction
may be very difficult to demonstrate. Obvious causes for hydroxephrosis
are stones in the kidney, ureter or bladder and pressure upon the urinary
tract by tunion.

The areter is generally dilated to a diameter of from one fourth to one half inch and it may be so large as to be easily mistaken for the intestine. Usually the areters appear much slongated and succellated; the privis and the calices of the kidney may be slightly dilated or the greater part of the kidney may be destroyed, leaving only a series of communicating pockets surrounded by a thin cortex of renal tissue. After a time chronic nephratis usually develops. This may involve both kidneys, even though the hydronephrosis is unilateral.

If hydronephrosis is unilateral there may be no symptoms until the dilatation of the polvis of the kidney has reached a sufficient size to form an abdominal tumor. In most of the cases in children this condition has been noted between the third and the eleventh years. The tumor may be situated in the lumber region, or it may fill the abdomen. It is cystic, and may be confounded with a dermoid syst of the overy. On aspiration a fintd is withdrawn which may be clear, or of a brownish color, and recognized as urine by the fact that it contains urates and urea. After aspiration the urine period per weetherse may be bloody. Aspiration affords only temporary relief, as the tumor quickly refills. The treatment is surgical. When the other kidney is normal nephrectomy often results in a permanent care.

Double hydronephrosis occurs much more frequently in the male. In infants and young children it not infrequently causes a definite and characteristic group of symptoms. It may be found in infants a few weeks old or throughout childhood. Double hydronephrosis, however, is generally associated with, or results in, such changes in the kidneys that the patients die during infancy.

The cause of double hydronephrosis is usually to be found in the posterior urethra. While several abnormalities have been described the most common one is an exaggeration of the normal fields of muccus membrane that lead from the verymontanum to the wall of the urethra. These folds are sometimes greatly hypertrophied and so situated as to make a disphragm across the urethra in which there is usually a small, shit-like opening. There is thus produced a great obstacle to the passage of urine. The changes produced in the bladder, ursters and kidner are very extensive. The blodder is much increased in thickness but is not dilated. The walls of the Robber may be as much as a quarter or a third of an inch in thickness. The prefers are greatly diluted and are often an inch or more in digneter. They are tortuous, their walls are thickened and thrown into folils. The kidneys are increased in size, due entirely to the hydronephrosis, for, as a result of this, the renal substance may be reduced to a minimum. They consist of a mass of dilated, communicating cystic spaces surrounded by a shell of renal tissue. The structure of cortex and medulla may be indistinguishable. Secondary infection not infrequently occurs, in which case the bladder, ureters and kidneys may contain pas and there may be abscesses in the substance of the kidney. An excellent example of this condition is shown in Fig. 84. The damage to the kidneys may be so great that the infant does shortly. after birth. When it is less, life may be prolonged for months or years.

The history is at times quite characteristic. There may have been difficulty in urination and dribbling of urine from birth or it may not have been noticed until the child was a year or two old, or perhaps even later. With each attempt to pass urine only a small quantity is expelled after much straining. Examination of the alchonous above a firm, globular mass in the hypogastrium which remains even after urination. Leading up from this into the loin on each side there may often be felt

masses sometimes clongated, sometimes globular, which are the twisted tortuous ureters. The kidneys may or may not be felt. In the hilateral form of hydronephronis the renal tumors are usually not large, as tide would be impossible with the destruction of much renal substance on both sides. The masses may vary in size but the tumor formed by the bladder is the most constant one.



Pro. 84 - Concentrate Hypnogramous, Discrete Universe, and Hypnograms, Blazzage, (Press a child out morth old.)

Changes in the urine may not be present until the condition in far advanced. There may be all the symptoms of chronic diffuse nephritis ar when infection of the genital tract occurs, there are added the symptoms of pronephrosis. The course is usually progressive. More and more damage to the kidneys takes place until death scoults from aremia, from secondary infection, or from some intercurrent disease.

The treatment is surgical. The obstruction should be removed. If

this is done early before extensive changes in the kidneys have taken place life may be indefinitely prolonged. We have had two patients, three and four years of age, operated upon with very satisfactory results.

Morable Kidasy.—This is a rare condition in young shildren. Comby has collected eighteen cases, of which sixteen were in garls and two in boys. Morable kidney was recognized before the tenth year in eight cases, and in two of these before the fourth month. It has been accribed to too long a pedicle, which may be congenital; also to pressure from abdominal tumors and to injury. The most important symptoms are paroxysmal pain which may follow exertion, and a mayable tumor. A twist in the treater may produce hydromephrosis.

URIC-ACID INFARCTIONS

These consist in a deposit in the straight tubes of the kidneys of uric acid or of amorphous or crystalline urates; usually both kidneys are affected, and all the pyramids of each kidney. The infarctions appear to the naked eye as fine, hereenish-yellow, fan-shaped striae. Associated with them there may be granular deposits of unce-acid salts in the pelvis of the kidney, and sometimes ovidences of enterrhal inflammation of the pelvis, including even the presence of bleed. This condition probably occurs, to some degree at least, in nearly all infants during the first ten days of life. It was formerly supposed that the discovery of these appearances was proof that an infant had breathed, and a certain medicologal importance was therefore attached to them. This is now known not to be the case, as they are sometimes found in still-born infants.

The cause of this condition is the exerction of aric acid before there is sufficient water to dissolve it, so that the crystale are deposited in the tubes. Unic-acid infarctions are found chiefly in children dying before the end of the second week, although it is not uncommon to see them as late as the third or fourth or even the sixth month. In most of the cases, as the uninary secretion becomes more abundant, the deposits are washed out in the urine and appear as brownish-red or pink stains upon the napkins. Infarctions may give vise to a slight infarmation of the renal tubules, but very rarely to any serious bosion; sometimes they remain as deposits in the celices or the pelvis of the kidney or in the hladder, forming the nuclei of calcula. The symptoms to which they give rise are mainly scanty prination during the first week of life, and necessionally america for the first day or two. Sometimes there is evidence of severe pain; prispiem may be present, and there is the stain upon the napkin already referred to. The treatment is to give water freely and some alitatine discretic such as eitrate of potads. One grain should be

given every two hours until the secretion is fully established; this in most cases will be within twenty-four hours.

CHRONIC CONGESTION OF THE KIDNEYS

This results from interference with the return circulation of the kidney, and may be caused by congenital mulformation or valvular discase of the heart, stronge broughoppermenta or chronic plenricy; also by the presence of any abdominal tumor upon the inferior vena cava or the renal trius.

The kidneys are generally enlarged, firmer than normal, and darkrolond. All the capillary vessels are swellen and distended with blood,
and their walls are thickered. In addition to the symptoms of the primary disease, the amount of urine passed is usually searty and of high
specific gravity. Albumin and casts are generally present, but are not
constant. The treatment should be directed toward the primary condition, and, in addition, an effort should be made to increase the amount of
arine by alkaline directics, caffein, digitalis, and the sodium salicylate of
theoremin.

ACUTE DEGENERATION OF THE KIDNEYS

In the succeeding pages devoted to the kidney Prudden's classification in the main has been followed,

In scate degeneration of the kidney the principal or only change is in the epithelium of the tubules. It is exceedingly common both in infancy and in childhood, being found to a greater or less degree in all sutopoies upon patients dying of neute infectious diseases, but it is most marked in cases of scarlet fever, diplitheria, and neute plearopneuments. It may be found in any disease characterized by prolonged high temperature, and it is the explanation of the cases of so-called febrile albuminaria. The cause is in all probability direct irritation of the epithelium of the tubules by the toxins eliminated by the kidneys. It may also be induced by irritating drugs, such as cantharides or turpentine. By some writers these cases have been classed as examples of acute rephritis; hence the great discrepancy which exists in statements made as to the frequency of rephritis in the different infectious diseases.

The kidneys are usually slightly enlarged, softer, and paler than normal. On section the cortex may be somewhat thickened, and the straight initiales marked by yellowish-gray lines. It is the appearance commonly spakes of as cloudy swelling. The kidneys are seldom much congested. The microscope shows a granular dependration of the opitielium of the tubules, and when errore this may be accompanied by congestion and the exudation of serum.

Acute degeneration of the kidneys gives rise to no symptoms in addition to those of the original disease, except the appearance of a moderate amount of albumin in the urine, with a few hyaline, granular, or epithelial casts. It can not be said that such a condition while much to the danger from the original disease. In cases that recover, the condition of the kidney becomes entirely normal. The development of the symptoms of degeneration of the kidneys in inflections diseases calls for no special treatment beyond a continuance of the fluid dist.

ACUTE DIFFUSE NEPHRITIS

(Acute Intentitial Nephritis, Acute Exuditive Nephritis; Glumerulonephritis; Acute Bright's Disease.)

Etiology.—This variety of nephratis accurs apparently as a primary disease both in infants and in older children. Most such cases are undoubtedly of infectious origin, although the point of entrance of the infection it may be difficult or impossible to determine. Acute diffuse nephritis is very frequently accordary to the acute infectious diseases, especially to sourlet fever and diphtheria. It occasionally follows measles. varicella, emprema, typheid fever, acute diarrheal diseases, posumonia, meningitis, influenza, and malaria. It is the characteristic variety of secondary nephritis occurring in severe septic conditions. Some children exhilot a predisposition to this disease and develop acute nephritis with almost any infectious disease, however milit, which they contract. The exciting cause of the inflammation is in some cases the irritation from toxins; but usually there is in addition the entrance of pathogenic organisms carried by the circulation. Thus in post-scarlatinal nephritis, of which the one under consideration is the characteristic form, the cause is now generally admitted to be the toxins of the primary disease, to which in many cases is added infection by the streptococours. While asphritis is more frequent after severe attacks of searlet fever, it may occur after those which are very mild, even when putionts have been kept in bed. throughout the disease. The frequency of nephritis as a sequel of scarlet lever varies much in different epidemics; the average is from six to ten per cent. We have even two cases of acute nephratis in infants, the apparent cause of which was the irritation of a highly concentrated urine. This was the result of the infants taking for a long time very little food and almost no water.

Lesions.—In severe cases the kidneys are usually enlarged, soft, and edematous. The capsule is non-adherent. The cortex is thickened, either

reddened or pule; frequently it is mettled with red, owing to the presence of small hemorrhages. There may be congestion of the entire organ; or the pyramids may seem unusually red by contrast with the pule and thickened cortex.

All the structures of the kidney—glomeruli, tubular epithelium, and interstitial tissue—are involved in the inflammatory process. The cells covering the glomerular tufts of capillaries are seedlen and proliferated. They have frequently undergone fatty degeneration. The epithelial cells lining Bowman's capsule may undergo the same changes, but usually to a lesser degree. The space between the capsule and the tuft may contain exfoliated epithelium in considerable quantity, also cell-detritus, altaminous (granular) exudate, leucocytes, and red blood-cells. The tubular epithelium undergoes albuminous and fatty degeneration and may desquanate. Thus the tubules may contain epithelial fragments, serum, red blood-cells, leucocytes, and casts. The interstitial connective tissue is infiltrated with serum and in places with small round cells. In cases of longer duration a general increase of the connective tissue may take place, which is permanent.

When the glomerular changes are especially marked, as in scute aephritis following scarlet fever, the process is aften spokes of as glomeraloxephritie. If the degeneration of the tubular spithelium is extreme, as in severy cases of diphtheria dying shortly after the coset, the perbritis may be described as the pareacitymatous at degenerative type. In the hemorrhagic form there are hemorrhages into the talendes, glomerali, or interstitial tissue. In infants and young children the sendaline type of scute diffuse nephritis is especially frequent. In this there is an exulative inflammation with large accumulations of lencocytes, scrum, and red blood-cells in the glomerali and tabules, the parenchyma and interstitial tissue sometimes being markedly and sometimes but slightly changed. Should the interstitial tissue suffer early and severely, the nephritis becomes of the productive or intentified type. This form is most frequently seen with severe, protracted cases of searlet fever and diphtheria, especially in older children. It semetimes secure as an apparently independent process.

Symptoms.—I. Primary Form in Infants.—These cases are not common, and the symptoms are so obscure that they are often overlooked. A number of such cases have come under our observation. The inflammation in most of them was of the sandative type.

The enset in nearly every instance was abrupt, usually with high fever and semiting, the temperature being in several cases over 104° F. Dropsy was exceptional; in most of these it was slight, and seen only toward the close of the disease. Fever was present in all cases. In those observed by us it was high and irregular in type, ranging from 101° to

105° F. The duration of the disease was from one to four weeks, the average being about two and a half weeks. Vomiting and diarrhea were noted in half the cases, but were rarely prominent, and marked either the onset of the attack; or were traceable to indigestion accompanying the fever; very rarely dol they exist as symptoms of memia. Anemia was a prominent symptom in nearly every case, and it was this which called attention in several instances to the renal condition. Nervous symptoms were usually prominent. In several patients there was dyspass without polynomery disease and without syanosis, partly dise perhaps to the marked anemia, but probably due chiefly to the development of acidosis. In nearly all cases there was marked restlesiness or muscular twitchings, and in three there were convulsions. Dullness and spathy were present in the majority of the fatal cases, but deep come was never seen. The urine was rarely scanty until near the close of the disease, and sometimes not even then. Suppression of urine was seldom seen. Albumin was frequently absent early in the attack, but was invariably present at a late period, although rarely in large amount. Casts were found in all cases that were carefully examined microscopically. They were not usually numerous, and were chiefly of the hyaline, granular, and epithelial varieties. No blood casts were seen. There were usually many pus cells and renal epithelial cells, together with red blood-cells in moderate numbers.

Of the thirty-four cases collected, including our own, twenty-five died and only nine recovered. Whether these figures represent the actual mortality of the disease it is difficult to say. No doubt there are many mild cases which are increasingless. The severe sues, however, are quite uniformly fatal, chiefly on account of the tender age of the patients.

2. Primary Form in Other Children.—This also is a rare form of renal disease. The onset is usually less abrupt than in infants, the febrile symptoms are less marked, and the termination is less frequently fatal. Dropsy is rarely marked, and often is absent. The urine is only slightly diminished in quantity; the amount of albumin is small; casts are not numerous, and usually hyaline, epithelial, or granular; very rarely is there much blood present. Uremia is infrequent, and the prognosis is better than in infancy. The course may be very prolonged; but even when alluminaria has lasted several months recovery may be complete. The interstitial type may begin abruptly with febrile symptoms.

The interstitial type may begin abraptly with febrile symptoms, dropsy, headache, lumbar pains, sensity urine, and often with vomiting; or it may come on somewhat meidiously with few constitutional symptoms, but with dropsy and changes in the urine.

Secondary Form.—The secondary rephritis of scute infectious discuses may occur at the height of the febrile process or at a later period, and its security is generally proportionate to the intensity of the infection.

The general symptoms of nephritis are often not marked, and dropsy is rare; so that unless the urine is examined the condition may be overlooked. The urinary changes are essentially the same as those already mentioned in the primary cases. Suppression of urine and the development of the symptoms of acute uremia are infrequent. While nephritis adds considerably to the danger from the primary disease, it is selden itself the cause of death, although this is sometimes the case in scarlet fover and diphtheria.

The characteristic type of nephritis which follows searlet fever most frequently decadeps during the third or fourth week of the disease. The coset may be gradual, dropsy being first noticed. Or it may begin alemptly without dropsy, but with headache, counting, scanty urms, fever, and even convulsions. The temperature generally ranges from 100° to 101.5° F., but in very severe attacks it may be 104° or 105° F. While dropsy is usually present, it may be slight or absent in severe and even in fatal cases. It is first seen in the face, next in the feet, legs, and scrotum; there may be general unusarea, with dropsy of the serous cavities of the body, the plears, or the peritoneum, rarely the pericardium. As the disease progresses there is always a very marked degree of anomia.

The urine is, as a rule, greatly diminished in quantity, and may be suppressed. Allumin is invariably present, although not always at first; it is usually in large amount, aften enough to reader the urine solid upon boiling. The urine is of a dark, reddish-brown or smoky color, owing to the presence of red blood-cells or hemoglatin. The specific gravity may be low, even though the quantity is very small. Casts are present in great numbers, chiefly hyaline, granular, and spathelial mota-from the straight tubes; not infrequently there are blood casts. Bed blood-cells are present in great numbers; also many lenoscytes, and renal epithelium.

The duration of the active symptoms in cases terminating in recovery is from one to three weeks. The temperature and droppy gradually subside. Improvement in the urine is shown by an increase in quantity, by an increased elemination of crea, and by a diminution in the amount of blood, albumin, and the number of casts. A few casts may persist for several weeks, and a small amount of albumin for two or three months.

In the graver cases, when the onset is accompanied by high temperature, pain in the back and loins, and a rapid, full pulse of high tension, the urine is very scanty and is often suppressed. Then follow the symptoms of uremia. In children this is usually manifested by remiting, great restlessness or apathy, and often by diarrhea. Hyperpaea is not infrequent and is usually evidence of acidosis. Less frequently there is bendache, diamess of vision, staper developing into come, or convolsions. If the secretion of urine is re-calabilished, the nervous symptoms abute and the patient may recover. This has been known to occur after complete suppression has lasted thirty-six bours. Care should be taken not to mistake retention for suppression. If doubt exists, percussion of the bladder and the use of the catheter will quickly settle the question.

There are several complications for which the physician must constantly be on the bookout during attacks of arute nephritis; the most frequent are presuments, plearing, pericarditis, and endoughdits; more rarely there may be meningitis and edema of the glottis. It is from complications or neute uromis that death usually owners.

Prognosis.-This is to be considered from two points of view; first, the danger to life during the arule stage of the disease, and, secondly, the danger of the development of chronic nephritis. The majority of nationts survive the acute stage, and not infrequently even those recover who have presented grave symptoms of uremic poisoning. The quantity and specific gravity of the urine, the delayed elimination of phenolallphonephthalem, and the number and variety of the casts, are a much better guide in prognesis than the amount of albumin. The existence of acidosis and of severe persons symptoms, such as stupor, intense headache, dimness of vision, and persistent veniting, add much to the gravity of the case, as does also the presence of any serious complication. In general it may be said that if there is no suppression of urine, or if there are no symptoms of urema and no complications, recovery is almost certain if the child is over three years old; in wonger children the outlook is less favorable. The general opinion prevails that scale diffuse pephritis in childhood, whether it is primary or occurs as a complication of scarlet fever, is rarely followed by the chronic form of the disease; and such was the view we formerly held. Larger experience, however, has convinced us that this segred is not very uncommon-The interval of apparent health may sometimes cover a period of several years, and the later nephritis may be attributed to other causes; but all cases of scarlatinal nephritis should be carefully watched for a long time, and after a severe attack a guarded prognosis should always be given as regards the ultimate result."

Treatment,-Prophylaxis is important, and relates principally to the

^{*}The following case may be cited as an illustration of this point. A guil at the age of seven years had seatlet fever, followed by neghritis; the dropsy having lasted, it was reported, for those months. She was believed to have recovered perfectly, and remained in apparent health until the was seaten, when, as a supposed result of a severe shilling, the developed dropsy and all the symptoms of source replicits. From that time, although the lived for three years, and was often for mostle at a time seemingly in the best of health, for mine was never free from costs and albumin, and she finally died in sternic convolutions.

secondary form which occurs in the course of infectious diseases, especially to post-scarlatinal pephritis; but the measures here outlined apply equally to all varieties. The inflammation of the kidney being in most of these cases the result of direct arritation by the toxins which are eliminsted by them, it follows that elimination through the skin and intertimes should be increased, and that the urine should be rendered as little irritating as possible by largely increasing its quantity. The first infication is mot by frequent sponging, warm baths, and keeping the bowels freely opened by saline ratherties, sufficient being given to produce one or two loose movements daily. To meet the second indication, the pationt should be kept upon a diet of milk and faringeoids food, at least for the first three weeks of the disease, and, if possible, for a full munth, At the same time he should drink very freely of alkaline mineral waters, or of plain water. If milk is not well borne, kumyes, wher, or buttermalk may be used, or thin gracks mixed with milk. When the first trace of allomin appears in the urine this plan of treatment should incarriable be followed. In addition to these measures, after an attack of scarlet fover the patient should be kept in bed for at least a week after the temperature has become normal.

The mild cases of acute nephritis tend to spontaneous recovery under the bygrenic and dictetic treatment outlined, i. e., rest in bed, the diet mentioned, the drinking of large quantities of water, and attention to the action of the skin and bowels. These measures should be continued so long as the urine contains any considerable amount of albumin, or so long as the patient's general condition will permit. Should be becomvery attentic, or lose much in weight, it may be necessary to enlarge the diet by the addition of more solid food. An increase in the diet and exercise should be made very gradually, and the effect upon the urins carefully watched.

The severe cases, with scanty urine, fever and marked dropsy, require more active treatment. Free displaces is should be maintained by the hot pack or vapor both. Active counter-sentation should be used over the kidneys by dry caps followed by positives, or the mastard pacts. Two or three loose movements from the bowels should be secured by the administration of calonel or, better by Rochelle or Egrom salts. Harm is sometimes done by carrying this depletion too far, and its effect upon the patient's general condition must be closely watched. If suppression of urine occurs with the development of uremic symptome-delirium, vomiting, diarrhea, and a pulse of high tension—venescion should be practiced; from three to six ounces of blood may be drawn from a child of five years, according to his general condition and the argeory of the symptoms. The depressing effect may largely be overcome by the mediately following this with an intravenous injection of a normal salt

solution. Twice as much as the fluid frawn should be introduced. This will almost invariably give at least temporary relief, which may afford time for the operation of other measures, such as eathers and disphoresis. Pulmonary edema is rather an indication to bleeding; the best of all guides us to its use is a pulse of very high tension.

In addition to these measures rectal injections of a normal salt solution may be given high in the colon, at a temperature of from 104° to 108° F. At least two quarts should be given several times a day, to be continued until a free flow of urine is established. This is one of the most valuable needs we possess of increasing elimination by the kidneys and skin.

The nervous symptoms of uremin are best relieved by chloral, which should be given per rectum. When such symptoms are marked, from six to ten grains are required for a child of five years, to be repeated in two hours if no improvement is seen. Uremic convulsions may sometimes be averted by the use of morphin hypodermically.

One should always be on the lookest for complications, especially dropsy of the series cavities, pericarditis, and elemit of the lungs. Contalescence is nearly always slow, and a patient who has suffered from applicitis needs careful attention for a long time. Anemia is always present, and iron is required. The diet should be carefully restricted for several months; much nitrogenous food should be avoided. If the disease tends to pass into a subscute form, the child should, if possible, he sent to a warm elimate, and kept there during the succeeding winter, and every means taken to improve the general nutrition. Flannels should be worn next to the skin, and special precautions taken against any exposure which might cause an exacerbation of the disease.

CHRONIC NEPHRITIS

Chronic inflammation of the kidney is an infrequent condition in childhood. In inflancy it is almost unknown, except in connection with congenital hydronephronic or other malformations of the kidney. Two pathological varieties are met with: (1) chronic diffuse nephritis of the parenchymatous or degenerative type; (2) chronic diffuse nephritis of the interstitial or productive type. As the disease progresses the former may assume the characteristics of the latter variety.

Etislogy.—Chronic nephritis is most frequently seen as a sequel of the nexte nephritis of scarlet fever, less often after other acute infections. The only other important causes in early life are hereditary syphilis, chronic tuberculosis, and valvular disease of the heart. Nearly all the cases occur in children over five years of age. Lesions.—The lesions of chronic nephritis in childhood do not differ essentially from those seen in later life. In the chronic purenchymataus type the hidneys are usually enlarged, the surface is smooth or slightly nodular, and the thickened cortex yellowish-white on section. These are often called "large white kidneys." On the other hand, the kidneys may be nearly normal in appearance, or smaller and with a thinner cortex than is notal. In the so-called "large red kidneys" the cortex is red ar mottled red and yellow, owing to homorrhapes into the tabules or interstitial tooms. The microscope shows that the renal epithetium is swellen, granular, fatty, and degenerated. The tubes contain leaveryles, red cells, cust matter, and the detritue of broken-down epithelial cells. In some places they are dilated, in others atrophied. In the glomerali there is a growth of cells, compression and atrophy of the tufts, with the formation of new connective tissue.

In the chronic diffuse nephritis of the interstitial type (granular kidney) the organs are smaller than normal, with a nedular surface and adherent supouls. The cortex is thinned, and the color is gray or red. In addition to the losions found in the proceding surjety, there is an extensive production of new connective tissue, which is irregularly distributed throughout the kidneys. The tubules in some places are dilated to form cysts of considerable size, while in others they have completely disappeared. The glomerule may be atrophied to little fibrons hells; or if shronic congestion has preceded the inflammation, some may be large and the capillaries dilated with hyaline degeneration of their walls.

Symptoms.—1. Chronic Nephrids of the Pureacitymatous Type.— This form of the disease may be chronic from the outset, or follow an acute attack from which the patient is often believed to have recovered completely. The symptoms cometimes immediately follow the acute attack; at others there is an interval of apparent recovery, extending over a few months or even years. Very rarely no such history of an unfecedent scate attack can be obtained and the symptoms came on gradually and insoftonsly. Such cases occur claimly in other children, and their clinical features do not differ essentially from those of adult life.

As a rule dropsy is present, although it is variable in amount, and fluctuates considerably from time to time. There may be not only selema of the cellular tissue, but effusion into the pleura, the peritonsus, and even the pericardism. As the case progresses, ascenia is always a marked symptom. There are various disturbances of digestion—loss of appetite, occasional vomiting, and attacks of distribus. From time to time nervices symptoms may be quite preminent, such as bendaches, deep-lessness, accuralgia, fatigue upon slight exertion, and dyspace. Acidosis

may develop as it does in the rephritis of adults. Attacks of epistaxis are not infrequent.

For the greater part of the time the urine contains albumin and casts. They vary much in amount at different periods in the disease, according to the rapidity of its progress. During periods of exacerbation, both albumin and casts are very abundant, while in the intervals the amount of albumin may be small and the casts few. The casts are byaline, granular, epithelial, and fatty. The shilly quantity of urine is much reduced during the periods of exacerbation, while at other times it may be nearly normal. The specific gravity a usually normal or high.

If amyloid degeneration is present, there are generally associated with the renal symptoms, others dependent upon amyloid changes in other organs. The sphere and liver are calarged; there may be ascites and diarrhea, and there is usually present a populiar alchaeter cachexia.

The duration of this form of chronic nephritis depends much upon the surroundings of the patient and the treatment. It is rarely shorter than two years, and it may last for many years. The progress is always tregular and marked by periods of exacerbation and reminion. The patients die from neute uremin, from some intercurrent disease, or from complicating pneumonia, pleurisy, percurditis, endocarditis, or from pulmonary oferm.

2. Chronic Nephrills of the Interestitial Type-This is a very tart disease in early life, being much less frequent even than the preceding variety of nephritis. In some cases there is a history of hereditary sombilis; in others, of chronic alcoholism. The early symptoms are few, and the disease usually develops mandistraty. The urine is pale, excessive in amount, and of low specific gravity-1,001 to 1,008. Albumin is often about, and, when found, the quantity is small. Dropey likewise is rare, and never marked. Norrous symptoms are often prominent, such as headache, attacks of spasmodic dyspues resembling asthma, neuralgias, and disturbances of vision. High blood-pressure and hypertrophy of the left centricle are regular symptoms; and even atheremstous degeneration of the arteries may be present. Duckinson reports an instance of this in a patient only six years of age. Late in the disease, hemorrhages may occur, and these way he the cause of feath. Felaton has reported a cerebral bemorrhage in a child of clean years. Acute uremin with acidesis is, however, the usual termination of this form of nephritis. The course is slow, and the disease mer be overlooked until the final uremic symptoms occur.

Prognosis.—The progness of chronic nephritis as to complete recovery is always unfavorable; and although cases are seen in which symptems are absent for several years, they almost invariably return. As to the duration of the disease, no exact progness can be given, because

from the symptoms it is difficult or impossible to determine exactly the extent of the disease in the kidney and the rapidity of its progress. The continued passage of a large amount of urine of low specific gravity is invariably to be interpreted as evidence of fibroid changes in the Malpaghian trafts, and is a bad symptom. A large amount of dropsy, the coexistence of valvalar disease of the heart, and marked renal insufficiency, as shown by the quantitative examination of the urine and by the phenoloophionephthalein test, are all very unfavorable symptoms.

Diagnesis.—Chronic nephratis, like the acute forms, is likely to be overlooked because of the failure to examine the urine in children. Regular and frequent examinations should be made in all cases of convulsions, of persistent or frequent headaches, severe anemia, hypertrophy of the heart, high blood-pressure and of general malautrition, as well as when the more obvious symptoms of renal disease, such as frequent scanty urine, are present. Nor should one be too ready to make the diagnosis of functional alluminuria because he finds albumin only accusionally and in small quantity. All such cases demand most careful observation and the closest attention for a long period before excluding organic renal disease.

Treatment.-Children with chronic peptiritis are to be treated on the same general plan as adults. The purpose of treatment is to retard as much as possible the progress of the disease and to relieve the symptoms as ther arise. It is of the greatest importance to remove the patient from conditions in which exacerbations are liable to occur. If it is possible, he should be sent to a warm, dry climate in winter, and all exposure to cold avoided; an autodoor life is desirable. Most patients require general tonic treatment with very moderate but regular coursies, never carried to the point of fatigue, as much rest as possible in a recumbent position, a fluid diet, consisting largely of milk as long as this can be herne, and the administration of iron. Dropey calls for a salt-free diet, discretice, raline cuthartics, and vascular stimulants. If memia develops, with high arterial tension and stuper, headache, and convulsions, venescrison should be resorted to, or nitroglycerin used. Morphin may be given hypodermically if the nervous symptoms are very marked.

Decapeulation of the kidney is to be considered in cases growing progressively worse in spite of medical treatment. The immediate risks of the operation are rather less than would be expected. We have seen striking temporary benefit in several cases when this operation was done upon young children. In no case, however, was the improvement permanent, all the patients dying within a year after it was performed.

TUBERCULOSIS OF THE KIDNEY

In general tuberculosis, miliary tubercles are frequently seen both upon the surface of the kidney and in its substance. These give rise to no symptoms and are of no clinical importance. Larger tuberculous deposits are extremely rare in early life. They usually occur in patients who are the subjects of general tuberculous, and are associated with tuberculosa of other parts of the genito-arinary tract, or they may exist as apparently the primary and only tuberculous lesion in the hody. Ascending infection occurs occasionally but it is rare; nearly all cases are of the descending type, i. s., primary in the kidney. Infection of the kidney. therefore generally takes place through the circulation and not from the Madder. Aldibert's figures show that in children the bladder usually compes even when the kidneys are tuberculous, for of thirteen cases of renal tamerealoss the blaider was involved in but two. The disease when primary begins in the cortex, but soon extends to the mucous membrane of the peltis and the calices of the kalney, and also to the pyramids. As a rule, but one kidney is affected. The process pay be confined for the pyramids, where are found cheesy nodules which may be single or multiple. These ultimately break flows and form abscoors. The process may result in almost complete destruction of the pyramids, and even of pertions of the cortex, so that the kidney may consist of a mere shell of renal tisone. Supporation in the neighborhood of the kidney (perinephritic abscess) often coexists.

The symptoms are quite indefinite. There may be localized pain and tenderness in the region of the kidney, and a terner if there is perinephritis. The symptoms of irritability of the bladder may be almost as serere as in cases of calculus. Pus usually appears in the urine as a constant symptom, and blood is often present. But the only thing that is

diagnostic is the discovery of tubercle becilli in the urine.

The treatment is the same as in adults.

TUMORS OF THE KIDNEY

In the great majority of cases tomors of the kidneys are malignant. Of fifty-one cases collected by Aldihert which were operated upon, forty-

eight were realignant, and three benign.

Malignant greaths are almost invariably primary. In children under five years, although not common, they are yet more frequent than any other variety of malignant rumor of the abdomen. Nearly all those tumors belong to the class of embryonal admissircoms. They contain remnants of fetal those and in many instances are undoubtedly congenital. Tomors growing from the adrenals belong to a different grouphypersophroms. Benal tumors may grow from the cortex of the kidney, or from the polyis, sometimes from the adrenals. They may infiltrate the whole kniney, so that there is no trace of renal structure remaining. or they may form an immense tumer on one side of the kidney, which is only partially invaded. These tumors are very much cratic, but they are quite soft, and hemorrhages often secur into their substance. There may be secondary growths in the liver, the lungs, the retroperitoneal glands, in the opposite kidney, the intestines, the panerous, and rurely in the skull. Pressure of the turner upon the areter may lead to hydroreplicate, and upon the inferior vera cava, to thrembesis of that resel. As it grows, the tumor succtimes becomes adherent to nearly all the abdominal organs by breaking peritonitis. It may lead to ascites, but it very rarely causes general peritonitie. The growth may reach a great vor, namely from five to fifteen pounds, but in one mer reported by Jacobi it weighed thirty-six pounds. In Schert's collection of fartreight cases the right kniner was involved in twenty-four, the left in twenty-two, and both kidneys in two cases.

Etiology.—These tumors of the kidney may be congenital. This was true of 5 cases in a series of 55 collected by Jacobi. The majority occur in early childhool. In the collection of 130 cases by Longstreet Taylor in which the ages are given, 100 were observed during the first five years, and 57 of these in the first two years of life. The seas were about equally affected.

Symptoms.—The principal symptoms are tumor, homaturia, and conherms. The tumor is nearly first noticed. It is in most cases discovered in the hole, but grows forward toward the median line. Its surface may be lobulated and irregular or quite smooth; and although solid, it is sometimes so soft as to give an obscure sensation of fluctuation. It may grow to an enormous size, causing displacement of the liver, spleen, intestines, and lungs. The progress of the growth is usually rapid, so that from the size of a fist, the tumor may grow in the course of five or six months so as nearly to fill the abdomen. By careful palpation it will be found—certainly when the tumor is small—that although it may be quite freely miscable, its attachment is near the lumber spine.

Hematuria may in rare cases be the first symptom noticed. The amount of blood passed is sometimes quite large, but is usually small, and those may be discovered only by the microscope. Pain is rare, and is due to localized peritonitis. Constitutional symptoms are usually about until the tumor has attained a large size, when a cuchesia develops and the patient wastes stendily. The pressure effects are dyspace, from compression of the lungs; edema of the lower extremities, from pressure upon or thrombosis of the vena cave; romiting and indigestion from pressure upon the stomach and intertines. Tumors of the supersenals have a marked tendency to produce metastass in the skull. The tumor may remain small and the metastass may be considered the primary growth. Precurious sexual development is often seen with supersenal tumors.

The course of the dissace is steadily from had to noise. The usual duration of life in patients not operated upon is from three to ten months after the tumor is large enough to be discovared.

Diagnesis.—The important points are, the position and attachment of the tumor, its steady growth and solid character, bematures, and the age of the patient (under five years). It may be confounded with hydronephrosis, dermoid cust of the every, enlargement of the sphere, retroperatoneal surcome, tumors of the hiver, or even of the abdomical wall.

Treatment.—Nothing is to be said regarding the medical treatment of these cases. Unless operated upon, they invariably terminate fatally. Some of the results of operation during recent years have been



Fig. 65.—Suprems or run Kneeps. Child thislers is able to Weight of tenor, sepen penals. This parity was followed for system yours and there was no recurrence.

encouraging and no case should be attendened, no matter how young the patient; but a recurrence in a few weeks or months is the usual result.

Benign Tumors.—These are very rare. They are distinguished by their slow growth, and by the fact that the constitutional symptoms armild or wanting. Of the three cases mentioned by Aldsbert, one was adenoma, one fibrouna, and one was fibrocystic.

PYELITIS-PYELOCYSTITIS

Pyclitis is an inflammation of the mucous membrane lining the peltis of the kidney; systitis is an inflammation of the mucous membrane of the bladder. They may exist separately or together. With pyclitis there may be inflammation of the oreter or of the kidney itself (pychonephratis), and it may be mute or chronic. It may result in the necesmulation of pus in considerable amount in the pelvis of the kidney (pyonephrosis).

Etiology.—Pyolitis may be secondary to local conditions in the genito-urinary tract. It is regularly present with renal calculi. It is also frequently associated with congenital malformations of the kidness or areters, with renal tuberculosis and renal tumers. It may result from an extension of inflammation from the tissues surrounding the kidney (perimphritis), or from an abscess opining into the pelvis of the kidney. Acute pyolitis sometimes occurs as a complication of scatlet or typhoid fever, diphtheria, influenza, or premia. The segmisms found in the strine in these cases are the streptococcus, the staphylococcus, the intercel bucillus, the typhoid bucillus, the bucillus procyaneus, and very rarely the diphtheria bucillus and other bacteria alone or in combination with the colon bucillus.

All these forms, however, are very infrequent compared with the form of preliceptitis which often occurs apparently as a primary affection. It may be found, however, in the course of any disease, and frequently follows acute disturbances of the gastro-intestinal tract, especially diarrhea. In these cases the oridences of inflammation of the bladder are slight or, more frequently, entirely wanting. This form of inflammation occurs with by far the greatest frequency in female infants. Male infants and older girls occusionally are the subjects of pyelitis. The organism present with great uniformity is the colon bucillus, usually alone. Progenic rocci are occasionally associated with it.

The infection has been assumed to be an ascending one, through the arethra, chiefly because of the great preponderance of the cases in girls; but this is by no means established. That infection may take place through the intestinal walls into the genito-arinary tract seems probable in view of the frequency with which pyclitis follows diarribes and by its occasional presence in boys. Infection through the blood does not seem to be a likely method, for blood cultures in these cases are uniformly negative. Pyclitis is quite frequent in the first two years, after that time the number of cases diminishes, but they may be found at any age.

Lesions.—When pyelitis develops from a local owne it is usually uni-

lateral; otherwise both sides are involved. In the cases of acute pyelitis or pyelocystitis there are the usual appearances of an acute catarrhal inflammation of the nuncous membrane with congestion, swelling and sometimes minute bemorrhages. There may be an accumulation of pus of considerable size distending the points and calices (pyonephrosis).

In most of the severe cases of positis there is also present a certain amount of rephritis. This may be merely degeneration or there may be collections of polymorphomuslear feacecytes and even the formation of masserous small abscesses throughout the parenchyma of the kidney. If the condition is one depositing upon a calculus or congenital deformity, and in all protracted and severe cases, the murous membrans of the polyis is extensively altered. It may be granular, irregularly thickened and present more or less ulceration. In the mre cases of diphtheritic pyclitis there is a false membrane. The kidney in all these forms is involved to a greater or less degree; the extent of the nephritis will depend upon the nature of the exciting cause and the duration of the process.

Symptoms.—There are few diseases in which there is such a great difference in the severity of the symptoms. In perhaps the majority of cases pyclitis is so mild as to cause no symptoms but a slight elevation of temperature of one or two degrees, which may be very temperary. It would entirely escape detection but for an examination of the urine. The pus may be present only in small amount, i. e., four to six cells in each microscopical field of uncentrifugalized urine, and for only a few days.

In other cases the symptoms may be quite severe. The history of the following case illustrates the main clinical features of acute prelitie,

in this instance occurring apparently as a primary disease;

A perviously healthy female infant of eight months was taken suddealy with a shill, followed by a very high fever. The child was ill for ten days before the nature of the disease was suspected. During this time the temperature ranged between 101° and 106° F., touching 105° nearly every day; but the shill was not repeated. The other constitutional symptoms were not severe. At the first examination of the urine there was found a large amount of pas, which on standing was equal to one-twelfth of the volume of the name passed; the reaction was strongly read. There were no signs of vaginities or sulvities, no order neisses, no evidence of local pain either in the bladder or kidney, no abnormal frequency of micturition, no localized tenderness, and no contiting. At later examinations there were found in moderate numbers epithelial cells from the bladder, and the tubules and polvis of the kidney, also a few busine casts, but not more allumin than would be explained by the amount of pas. Under no treatment except alkaline directics, the temperature gradually fell to normal, and the pus steadily diminished in quantity, and at the end of five weeks had practically disappeared from the arine. The child remained well and entirely free from urinary symptoms.

In some cases there are recurring chills, with wide fluctuations in temperature; in others there may be only pyuria, with moderate feren and few other constitutional symptoms. The course of the temperature is a very irregular suc. The fever is addom continuous, but may be interrupted by periods of normal temperature, lasting several days. A polymorphomiclear leucorrtons is present. The number of cells is nonally from 15,000 to 30,000. An application reaction of the colon bacillus with the patient's blood can usually be obtained, often in high dilution. The duration of the acute attack may be from a few days to six or eight weeks, and pus cells may be found microscopically for a much longer time. If the disease remplicates one of the scute infertion diseases, pyuria may be the only symptom. If cyclidis is also present micharition is frequent, and may be painful. The arine in scale prelocatitis is turbed from the presence of pus, the amount of which may be from one to fifty per cent of the column of the neine. The amount of pas varies greatly from day to day. It is often abundant when the temperature is low, and almost absent when the temperature is high, this fluctuation depending upon the accumulation or the discharge of the pas. The quantity of urine is generally somewhat diminisland, and it may be quite scanty. The reaction is notally acid, even though the amount of pus is large. Albumin is present in proportion to the amount of pus or the degree of nephritis. Red blood-cells are found under the microscope in most of the very acute cases, and may be in sufficient number to color the urins. The pur cells in recent cases are morally well preserved, but in old cases they may be degenerated. There are many spithelial cells-conical, finiform, and irregular cells with long tails. There may be recal spithelium and hyaline, granular, or epithelial racis, varying in number with the security of the nephritis. In a catheterized specimen the colon barillus is usually present in pure culture.

There is at times seen a particularly severe form of prelitis. It affects loss as well as girls, usually in the first two years of life. The error is sharp with force, gastro-intestinal symptoms, occasionally convisions, and the temperature is often continuously high. The prestration is extreme, the loss of appetite marked, and anemia develops very rapidly. There is irritability and hyperesthesis, nunctimes so marked as to suggest meaningitie. The urine contains besides the pus, granular casts in large numbers. The course is prolonged and the mertality relatively high. About 10 per cent of such severe cases prove fatal from exhaus-

tion, from complications affecting the gastro-intestinal tract or the lungs. Thirmich and Göppert have reported a series of such cases that seem to be particularly prevalent in certain localities. We have ourselves observed a small number. The severity of the disease is undoubtedly due to the fact that the kidneys, as shown by antopsy, are severely involted. They are really cases of pyelenephritis.

Pyclitis in older children usually gives more local symptoms. There is frequently pain on urination. Pain in the abdomen or loins may be marked and there may be tenderness and even muscular rigidity. When the right side is involved it may be difficult to exclude appendi-

ritis.

Pyclitis has a marked tendency to recur. It may do this after a few weeks or menths or perhaps not for several years. Some children may suffer from a number of attacks. Others show few, if any, constitutional symptoms, but their urine for a long period may never be free from pus rells and there may be exacerbations with fever from time to time for many months.

In pyelitis depending upon congenital mulformations, pyuris is usually the only symptom, unless pyonephrosis is present. With calculi there is an acute or chronic pyelitis; there may be localized pain, tenderness, senetimes a tumor, occasionally hematuria, and perhaps a history of renal colic or the passage of gravel. With tuberculosis, there is chronic pyuria and the presence of tubercle lucilli in the urine. The symptoms of general tuberculosis are commonly associated. If there is perinephratis, the inflammation is usually acute, and there are present the local symptoms of the original disease. If an abscess opens into the pelvis of the kidney, there may be a solden discharge of pur in large quantity with a subsidence of previous local symptoms, including the tumor. With reoplasms, both pus and blood may be found in the urine, but the latter is more frequent.

Diagnosis.—The characteristic symptoms of acute pyelitis are chills, which may be repeated, high and fluctuating temperature, scanty urine containing pus, and occasionally pain and temberness over the kidneys. All of these may be shoent, however, except the fever and the pyuria, and both the fever and the pyuria may be intermittent. The diagnosis of pyelitis is made only by an examination of the urine, which, particularly in infancy, should never be omitted in cases of obscure high temperature, whether prolonged or only temporary. If pus is not found the examination should be repeated several times. When cystitis is associated, the only additional symptoms may be pain and other signs of tentical irritation. These symptoms, with an acid urine containing more or less pus and numerous epithelial cells, are sufficient to establish the diagnosis of pyelocystitis. If the pus comes from the opening of an

abscess into the bladder, ureter, or privile of the kidney, the local signs of such abscess will usually be present.

Prognosis.—In cases apparently primary, and especially in those due to the colon bacillus, the prognosis is good. The danger is chiefly from the nephritis which follows or complicates the process and to very young and poorly nourished infants who may die from exhaustion as the result of gastro-intestinal disturbance. The prognosis in the malignant form is always doubtful. In cases depending upon local conditions, the prognosis will depend upon the nature of the exciting cause. Here, also, the principal danger is from neghritis. If calculi are present and if pyonephronis occurs, the patient may she from exhaustion before a serious degree of applicits has deceloped.

Treatment.-Water should be given freely, and alkalis up to the point of neutralizing the excessive acidity of the urine. A large amount of alkali is necessary to accomplish this. Citrate of potash sufficient to repiler the urine alkaline in this condition is apt to rause diarrhea or vomiting. It is therefore wise to give not more than five or ten grains of this three times a day, but to give blearbonate of soda from twenty to thirty grains every four hours, according to the age of the patient. The urins should be kept alkaline for some time after the subsidence of all symptoms. The most widely used remedy is hexamethylenamin (urotropin), which may be given in doses of one or two grains every three hours to an infant of a year, and proportionate doses to older children. In order that this drug should have an antiseptic action the urine must be zeid. It is improper, therefore, to combine hexamethylenamin with alkalis. We have seen it used in large and small doses in cases of acute pyelitis, but have not been convinced of its value. Occasionally pyelitis is very resistent to any form of treatment, the exacerisations and remissions continuing for many weeks. For such obstinate cases exceines, preferably the antegenous variety, should be tried. Striking benefit has sometimes followed their use. If calculi are present or other conditions, such as perinephritis, etc., the methods of treatment applicable to these diseases are indicated.

RENAL CALCULI

Small renal calculi are very common in infancy. In the autopsy room we frequently see, on opening the kidneys of young infants, fine brown granules in the privis and calices, and occasionally a calculus as large as a small pea is found. They are usually composed of uric acid. Only once in over two thousand autopsies of which we have records, was a stone of any considerable size seen in an infant. In this case it was an inch in length and half an inch wide. It is surprising that these are so rare, when we consider how very frequently the minute calculi are met with. The probable explanation is, that the majority of them are dissolved or washed down into the bladder and passed per weetherns because of the find diet of the first two years. The granular deposits are usually lodged in the pelvis of the kidney, and are generally seen upon both sides. With the larger collections there is often a slight catarrial pyclitis.

Symptoms.—The small deposits give no symptoms, and even quite large calculi may be found at antepsy when no infraction of their persence had existed during life, as in the case above mentioned. In some cases symptoms are produced which resemble these of renal calculi in the adult. In infants less definite symptoms are often passed over as merely intestinal colic.

In well-marked cases in older children there is tenderness, pain localized over the affected kidney, or radiating to the bladder, the perinsum, and even the opposite kidney, and there may be irritation and retraction of the testicle. The urine may show, especially after exercise, a trace of blood; there may be the added symptoms of pyshitis, with some fever, localized tenderness, and the appearance in the urine of pus and epithelial cells from the pelvis of the kidney.

Renal colic is preduced when a stone of any considerable size passes from the kidney to the bladder. It is characterized by symptoms similar to those seen in the adult. There are under attacks of severe sickening pain in the loins, shooting down the thigh or to the testicle: There may be vamiling and even collapse. The urine is passed frequently, in small quantities, and contains blood. The symptoms quickly subside when the stone reaches the bladder. The calculus may sometimes become impacted in the ureter and give rise to hydronephrosis or pysnephrosis, which soon becomes pyclonephritis.

The existence of small calculi may be suspected from the symptoms above mentioned; the diagnosis is made positive by the appearance of gravel in the urine. The use of the X-ray is of service in recognizing even small calculi.

Treatment.—The only medical treatment consists in a fluid dist, the free use of alkaline mineral waters, and a sufficient quantity of some drag to render the urine alkaline. Such measures will relieve only the milder conditions. With larger calculi and more marked symptoms, a surgical operation should be considered and should be urged in propertion to the severity of the symptoms and the charmens of the diagnosis. If calculous prelitis exists, it is certain somewor later to lead to serious nephritis, and it is only a question of time when the sidney will be disabled. The same is true of hydromephrosis from the impaction of a calculus in the ureter. Aldibert has collected four cases of nephrectomy in

children for reual calculi in which the kidney was boolthy, with three recoveries and one death from shock. In nino cases of operation for calculous pyrapphenois, there were six recoveries and three deaths. The earlier the operation the greater the chances of success, because of the better condition of the other kidney. Although the continued use of water and the use of drags may rehere some of the symptoms, it is very questionable whether they do more.

PERINEPHRITIS.

This consists in an inflammation in the cellular tissue surrounding the kidney, which may terrotrate in resolution or in supparation. It is not of very uncommon occurrence. Perinciphritis may be secondary to supparative processes in the kidney itself, whether from calculi or taberculous deposits, or it may be primary. In children the latter is the common form. Primary perinciphritis is attributed to traumatism, cold, or exposure, or it may develop without assignable cause. It usually runs an acute or subscute course; very rarely it may be chronic.

For the clinical picture of this disease we are chiefly indebted to a paper by Gibney, who has published a report of twenty-eight cases of primary perinciphritis in children. The ages of these patients were between one and a half and fifteen years, the majority being between three and six years. The two sides and the two sease were about equally affected. About one-third of the cases were clearly traceable to transmitism; in the others no adequate exciting cause could be discovered. The majority of the cases were referred to the hospital with the diagnosis of hip-joint disease or caries of the spine. Resolution followed in twelve of these cases, and sixteen terminated in suppuration.

When abscess forms, it usually burrows between the lumbar mucles and comes to the surface posteriorly near the middle of the inocestal space; it may burrow forward between the abdominal muscles and point just above Poupart's ligament; very rarely it may follow the pross muscle and appear at the upper and inner aspect of the thigh, like an ordinary pross abscess; or it may open into the peritoneal cavity.

Symptoms,—The onset of acute perinephritis may be quite abrupt, with chill, fever, and localized pain; or it may be gradual, with stiffness of the spine, lameness referred to the hip, and deformity due to the contraction of the flexors of the thigh. The pain is usually felt in the loin, but may be referred to the groin, to the inner side of the thigh, or to the knot. It is often severe, and increased by using the limb. It is in most cases accompanied by localized tenderness in the neighborhood of the kidney. There is lameness upon the affected side, which may come on

gradually, being sometimes referred to the hip and sometimes to the spine. These symptoms often develop slowly in the course of two or three weeks. They are usually accompanied by a slight elevation of temperature. In the most sente cases the temperature is high (192" to 104" F.), and prestration severe.

As the disease progresses, fever is a constant symptom, the temporature usually varying between 101° and 101° F. There is in most cases increasing deformity, and finally the patient may be mable to walk at all. On examination at the height of the disease, there is found in a typical case a deviation of the spine with the concavity toward the affected side; the thigh may be held deced to a right angle; passive extension is resisted and causes pain, although all the other movements at the hip joint are normal. In the lumbar region there is tenderness, and there may be an area of infiltration filling the illocostal space. At first this is only appreciable by percussion, but later a distinct tumor is present. In addition to the tumor in the usual region, there is sometimes one at the upper and inner aspect of the thigh, owing to a burrowing of pus, and the sacs may communicate.

Lameness, pain, deformity, and fever sometimes exist for two or three weeks before any tumor can be made out. The constitutional symptoms are often severe. The size of the absence is sometimes very great. In one case we saw it extend from the spine to the median line in front, and from the crest of the illium nearly to the free border of the ribs. The amount of pus varies from a few sunces to two or three pints. Urinary symptoms are sometimes wanting; at other times there is increased frequency of micturition, accompanied by pain from an irritation referred to the bladder. The arine may contain pus from a complicating pyelitis. In only one of Gibney's cases was this present. It developed in the fourth week, and the child recovered.

The duration of the disease in the scute cases varies from three to eight weeks; in the subscute it may be five or six months. When supparation occurs the symptoms subside quite rapidly after the pas has been evacuated, and recovery is complete. When resolution takes place, there is a gradual subsidence of the symptoms, and often some stiffness of the thigh, with slight lameness for several months. In the series of cases above referred to, sixty-five per cent recovered completely in three months.

Diagnosis.—In many cases a diagnosis of hip-joint disease is made, but that disease develops more insoliously, is very much more chronic, and rarely produces so great deformity in a year as is often seen in perinaphritis in two or three weeks; abscess is infrequent during the first year of the disease. In perinephritis, on the other hand, we have a tallerably armis muset, semetimes with chill, fover, marked lameness, and deformity, developing in two or three weeks; abuses often forms in a month, and complete and permanent recovery usually follows after a few months at most; the deformity is due solely to flation of the thigh; all other movements at the hip may be free, and joint tenderness is absent. Passe absence from Pott's disease may cause deformity, tumor, and knowness similar to that seen in perinephritis, but on examination there is found the angular prominence and other signs of disease of the lumbar vertebras. In cases of doubt the tuberculin test may give important aid in diagnossis.

Prognesis.—Primary perinephritis in children almost invariably terminutes in complete recovery. Of the twenty-eight cases referred to, and eight subsequently observed by Gibney, all recovered perfectly. The only condition likely to prove fatal is rupture of the abscess into the

peritoneal cavity.

Treatment.—The patient should be put to bed and kept as quiet as possible throughout the attack. In the early stage, hot femeratations or an ace-bag should be applied over the affected side; heat is generally to be preferred. Abscesses should be opened early, to prevent burrowing and the danger of a possible rupture into the peritoneal cavity.

CHAPTER III

DISEASES OF THE GENITAL ORGANS

MALFORMATIONS

Adherent Prepare.—This condition is sometimes called false phimoais. It is so constantly present that it can hardly be regarded as a malformation. It is, however, a condition often needing attention in male infants. The prepare should be retracted so as to expose the glans completely. The smegma should then be washed away, the glans covered with a drop of oil, and the skin drawn forward. This should be repeated shally until there is no disposition to a recurrence of the adherions.

Phimosis.—This is such a narrowing of the prepace that it can not be retracted over the glans. The degree of phimosis varies greatly. In very rare cases there is no preputial opening. In other cases the ordice is so small that no part of the glans can be exposed, and there is obstruction to the outflow of urine; but usually a small part of the glans can be seen. Phimosis may be complicated by an elongated prepace (hypertrophic phimosis), and the clongation may exist without any narrowing of the orifice, although this is seemlly present to some degree.

The presence of phimosis makes cleanliness impossible in many cases, and want of cleanliness leads to infection and to balanitis. This is quite frequent, even in infants. It may be complicated by arethritis, and even by cystitis. Another consequence of the straining induced by phimosis is hernia, which may be either ingained or umbilical. To cure the hernia is often impossible, unless the phimosis is relieved. The list of reflex phenomena which have been ascribed to phimicals is a long one. There has been a disposition on the part of some to attribute nearly all the nervous disturbances of boxbood to phimoris, and an exaggerated importance has certainly been attached to this condition. A very marked slogree of phimosis often exists in children without producing any symptoms. That phimosis is an etiological factor in many neuroses is certainly to be doubted. Our experience with circumcision as a cure for such conditions has been very unsatisfactory. When cleanliness is incpossible the irritation and resulting prantis may cause frequent primpism and may at times encourage masturbation. Phinosis may rarely lead to vesical spasm and retention of urine, but more frequently to nocturnal incontinence.

Treatment,—Phimosis should receive attention in infancy. Often very little treatment is needed. When there is a very long prepare with phimosis, the operation of circumcinion should be done, even when the degree of phimosis is slight. Many cases of phimosis in which the prepare is not long can be relieved by stretching. If no part of the glans can be exposed, the simplest plan is to slit up the dorsum of the prepare with a pair of scissors and break up the adhesions. The corners of the flaps thus made can then be snipped off and one statch inserted on either side. To promote cleanliness in older boys or in cases of bernia or prolapse and when phimosis is present, circumcision should be performed.

Hypespedies.—In this condition the urethra is not continued to the tip of the penis, but opens on the inferior surface some distance back, being represented in front of this only by a shallow furrow. In more severe cases there is a deep flaure which divides the scrotom, and constimes even the perineum. Into this fissure the urethra opens. This is a condition likely to be mistaken for that of hermaphrodism, especially as the testicles are frequently in the abdominal ravity.

Epispadias.—This is a condition in which the urethra opens on the dersal surface of the penis. It is much less frequent than hypospadias. There may be simply a division of the glans, or the fissure may extend the whole length of the organ and be complicated by exstrophy of the bladder.

Eastrophy of the Bladder.—In the complete form there is a median fissure from the umbilicus to the tip of the penis. It includes the an-

terior abdominal wall, the pelvic bones, and the urethra. The benes are entirely separated at the symphysis, or connected behind the bladder by a filtrous band. The hypogastric region is occupied by a red, mucous surface, slightly corrugated, which is all there is of the bladder. In the lower lateral portions of the red mucous membrane two slightly rounded elevations are seen, from which urine cores. These are the openings of the ureters. The penis is short, and presents a shallow farrow on its dorsal surface. The testes are often in the abdominal cavity.

An analogous deformity is sometimes seen in girls. There is a division of the cliteris and the labia minora and majora. The fissure may be so deep as to reach nearly to the anns. The vagina is usually absent. The rectum may open into the prolapsed bladder.

All these deformities are computible with long life. In exstraphy of the bladder, whether complete or partial, patients are a naisance to themselves and to all about them. It is almost impossible to prevent the clothing from being soaked with urine, which gives everything connected with the patient a strong ammoniacal odor. The skin is often excertated. Operation for the relief of these cases should always be undertaken. The operation to be recommended is the transplantation of the unstreinto some part of the large intestine, usually the rectum. The results are eften most surprising. The rectum soon becomes tolerant of the urine, holds it for hours without difficulty and evacuates it without discomfort. Ascending infection of the kidney seldom occurs.

Undescended Testicle—Crypterchidism.—In fetal life the testes are situated in the abdominal cavity below the kidneys. They usually descend into the scrotum during the ninth mouth, but in children born at term the testicles may be in the inguinal canal, or even in the abdomen. The former condition is quite frequent, being present in fully ten per cent of all male children. In most of these the descent takes place without difficulty during the first works of life, and causes no symptoms. In others the condition may persist. Spontaneous descent may take place at any time before puberty, the chances, however, steadily lessening as age advances. When in the inguinal canal, on account of its exposed situation, the testicle may be injured, or become painful and tender as puberty approaches. In any abnormal position it probably will not develop properly, and may remain without function, but interference with the development of the body is rare. Hernin is a frequent complication.

When in the inguinal canal, descent of the testicle may sometimes be facilitated by manipulation. If the condition is unilateral, operation is unnecessary except for relief of pain. If it is double, operation should be performed before pulserty, preferably from the minth to the eleventh year. Transplantation into the scretum is at this time simple, and neually successful. Should pain be persistent, and transplantation impossible, the testicle may be replaced in the abdominal carity. Removal is indicated only when degeneration has taken place.

With the exceptions already mentioned, deformities of the female genitals belong rather to gynecology than to pediatrics, since they are chiefly of the internal organs, and do not usually give symptoms before puberty.

DISEASES OF THE MALE GENERALS.

Balanitis.—Balanitis, or inflammation of the prepuce, is one of the results of phimests. It may follow decomposition of the amegina, infection of the murous membrane, injury, or masturbation. The parts are excilen, edematous, red, painful, and sometimes bathed in pas. Retraction of the prepuce is impossible. Under proper treatment the inflammation usually subsides in two or three days, but there may be some discharge for a considerable time. Aboves may follow, and even gangrene of the prepuce. The most sever cases are likely to be complicated by anterior methritis. We have frequently seen crystopelas start from balanitis, and occasionally diphtheria occurs here.

The object of treatment is to remove the irritating and infectious material lodged beneath the foreskin. This may be quite difficult. It is test accomplished by syringing with a 1-5,000 highland solution, and the constant application of a wet antisoptic dressing. Ice is often useful when the edema is great. It is sometimes necessary to slit up the prepace before the parts can be thoroughly cleaned, and in severe cases this is often the quickest method of cure. Circumcision should not be some during an attack.

Brethritis.—This, like the same disease in females, may be simple or specific. Both forms are much less frequent in hittle boys than in the other sex. In simple urethritis the inflammation usually affects only the anterior part of the canal, the fossa navicularie. There is a slight discharge of pas, and sometimes pain on micharition. The most frequent cross is want of cleanliness.

Generoccus inflammation is more common. This occurs even in inlants, but most of the cases are in those over seven years old. The usual came is direct contagion. The symptoms are more severe than in the simple form, and resemble the same disease in the adult, with the exception that constitutional symptoms are usually absent. A microscopical stamination of the duscharge is the only positive means of diagnosis between the two varieties. In these cases it reveals the genericus in great numbers. Conjunctivitis and arthritis are seen as complications, just as in the female. Epididymitis is rare, but balanitis and babe are not infrequent. Poynter has reported a case in a bey of three years, who, when five years old, required treatment for a unethral stricture. He was infected by a nurse.

The first thing in the treatment is always to keep the parts covered, otherwise the infection may be carried by the hands to other mucous membranes, usually the conjunctive. In other respects the treatment is the same as in the adult.

Hydrocele.—Hydrocele consists in an accumulation of serum in scene part of the serous pouch brought down by the testicle in its descent. In infants it is usually due to the imperfect closure of this peach at some point, where a fluid accumulation occurs. Four varieties of hydrocele are met with in young shidten.

- 1. Conquistal Hydrocele.—In this the condition is a conquistal one, although the tumor is not necessarily present at birth. The tumor ragionalis communicates with the general peritoneal cavity. There is present an elongated tumor, extending from the bottom of the scrotum throughout the whole length of the cord. The tumor is reducible, sometimes spontaneously by position, semetimes, when the opening is smaller, only by pressure. It reduces slowly, without gurgling, never going back as many like a hernia. The tumor is translucent, and is that on percussion. The testicle is above and posterior, and usually indistinctly felt. Congenital hydrocele may be complicated by hernia.
- ‡. Hydrocele of the Punica Vaginalis with the Canal Closed,—In this form the occumulation of fluid is in the acrotum, communication with the peritoneal cavity having been entirely cut off by the complete obliteration of this peach in the canal in the normal way. This is one of the most frequent forms. It gives rise to an oval or pear-shaped tamor, quite tense and firm, usually about two inches in length. The rend is distinctly felt above it, the testicle is behind and somewhat above it, and not always felt very distinctly. This variety gives translucency and the usual elastic feeling of a hydrocele.
- 3. Hydrocele of the Cord.—This is one of the rare forms. The serous pouch which accompanies the spermatic cord is spen above, and communicates with the peritoreal cavity; but below it is closed. The serotum is normal, and the testicle is in its usual position. The tumor is small, elongated, reducible; and entirely above the scretum. Usually it stope at some point in the inguinal canal. This hydrocele also may be rempleted by bernia. The diagnostic points are the same as in the form first mentioned.
- 4. Encycled Hydrocele of the Cord.—The peritoneal peach of the cord in this variety is closed for some distance above, and again below, but somewhere in its course it is open, and here the finid accumulates in the form of a cyst. When small it resembles an undescended testicle; but on examination this organ is found below and in its normal position.

Whose in the canal, it is often mistaken for a lymph gland, sometimes for a small herais. The tumor is usually about the size of an almond. It is elastic and irreducible, and translucent like the other varieties.

Treatment of Hydrocole.—In the congenital form the application of a truss will sometimes cause obliteration of the canal, so as to shot off the hydrocole suc from the general peritonical cavity. It is subsequently managed like an ordinary hydrocole of the tunice vaginalis. In infants and young children it is rare that active operative measures are called for in any variety of hydrocole, as these usually tend to disappear spontaneously in the course of a few months. India may be applied locally over a hydrocole of the cord, but should not be applied to the scrotum. Some cases are cared by a simple peneture with a needle, allowing the fluid to drain off into the collular tosone of the scrotum from which it is absorbed; others by a single aspiration with a hyposlermic syrings. It is seldem necessary to resort to the injection of irritants like isdia or carbolic acid, but they may be used if the fluid returns after repeated aspirations.

DISEASES OF THE FEMALE GENITALS.

VACCINETIS

This is a cutarrhal inflammation usually affecting only the vaginal muceus membrane, but may involve the urethra, bladder, and, in older girls, the lining membrane of the uterus, the tubes, and even the pentoneum. It may be either simple or specific (genorrheal); the puralent form is almost invariably specific.

Simple Vaginal Catarrh.—This may be seen at any age, even in infancy, but is most frequent after the second year. It seems especially in girls suffering from maloutrition and anemia, and whose personal elemliness is neglected. It may follow any of the infectious diseases, particularly measles. It sometimes complicates varicella with a local lesion in the ragins. It may be transmite, as from attempted rape or the introduction of foreign bodies. Other causes are pinworms and scabins. It is accretimes the cause, sometimes the result of masturbation.

The disease generally begins as a subscate catarrhal inflammation, the disebarge being the first, and in mild cases the only symptom. It is of a white or yellowish-whole color and not very abundant. If the parts are not kept close the odor of the discharge is quite foul. In severe cases the discharge is abundant, and may excernite the skin of the labia and thighs. The mucous membrane is avoiled and red, but there is only a moderate secretion. Microscopical examination of the discharge shows bacteria in large numbers and of many varieties, but they are chiefly the ordinary cocci. With proper treatment and in children who are in good general condition, the disease usually lasts but a few weeks. Under unfavorable conditions a bescorrheal discharge may continue for a anoth longer time.

Cases of simple vaginal catarrh should be irrigated daily with a warm saturated solution of boric acid or 1 to 5,000 bechlorid. Cleanliness should be secured by frequent bathing and the skin protected by sintments. In more severe cases, astrongent injections, such as sulphate of sine and tannic acid (of each one dram to a pint of water) should be used. The general health should be built up by iron, cod-liver sil, and other tonics.

Consecceus Vaginitis.-This disease once considered rare in children has been shown to be exceedingly common in girls of all ages, even in young infants. Its control has become a social problem of much importance, and one that is beset with poculiar difficulties. Generoceus raginitis is an especial socurge in institutions, in homes and asylems for older girls, and in those for infants as well; also in hospitals, particularly those in which prolonged residence is necessary. Routine examinations made in large institutions for children have rerealed the presence of this disease, often, it is true, in a mild form, in from ? to 16 per sent of the female inmates. In a single year, of 1,000 children under three years, chiedy infants, applying for admission to the Balves' Hospital, 63, nearly ten per cent of the females, were found to be sufforing from gonococcus vaginitis. Epidemics in institutions are frequent and very difficult to control. Before means of prevention were as well understood as they are now, four epidemies were observed in the Baldes' Hospital in five years, with 275 cases." Day numeries are auother common agency of syrculing the disease,

But genococcus vaginitie is by no means confined to the classes mentioned. In out-patient practice and among the poor who live in tenements, it is common in girls of the school age who have never been exposed in institutions. Even in private practice among the well-to-da, cases are not very rare.

The ultimate source of infection in children with this disease in most cases is undoubtedly contact in the home with adults suffering from it. In several series of cases carefully investigated fully one-third have been definitely traced to a mother or sister suffering from the disease, with whom the young child has slept. In the home, infection may also take place by boths, clothing, dirty tellets, etc. Among companions infection may take place by manual contact, musturbation being frequent among infected persons; in schools and other public places it may unquestion ably be spread by the tellet seat. Crimical assualt is a rare cause among children.

[&]quot;Goroccomis Infectious in Institutions," N. Y. Medical Journal, March, 1905.

In institutions for infants and young children the disease is most often acquired through the medium of dispers. Other possible courses of contagion are towels, sponges, wash-cloths, clothing, bod linen, thermometers, syringes, both tubs, and both water. Even when the most careful attention is given to all these matters we have sometimes seen ward epidemics continue. The most probable explanation of such a condition is that the disease is spread by the bands of the nurse in washing, dressing, or the changing of asplains. In such cases nurses as well as infected children most be quarantimed. In some instances it is impossible to trace the mosts of spreading.

The susceptibility of the vagual inneous membrane to gonococcus infection is very great in young chibiren, which in part accounts for the prevalence of this discuss. A further reason for the frequency of infection is probably to be found in the want of protection of the mucous membrane owing to the small size of the labias. Vaginitis should not in early life be regarded as a venercal discuss.

The constant personce in cases of vaginitis in children of an organism which morphologically and culturally a identical with the genococcus found in acute inflammations in the solult, has led to the belief that the two diseases were identical. But the mildness of the local inflammation in the great majority of the cases in young children, the absence of constitutional symptoms and of serious complications has led to the suspicion that there might be important differences in the infecting agent in the two groups of cases. Pearce, of the Rockefeller Institute, has recently shown by immunological tests (agglutination and complement fixation) that the type of organism in the two groups is quite distinct. Not. a single exception was found in the cases studied. The infrequency of ophthalmia as a complication in little children has often been noted. In our own experience it has been rary. In this connection it is interesting to note that in cases of ophthalmia in infants studied by Peuros the organism corresponded in every instance to the adult type. Should these differences in type prove to be the rule, we may find that gonococcus vaginitis in voque children, though a most troublessme condition, is not so serious a matter as many have been inclined to regard it.

Symptons.—In the mild cases the disease is limited to the mucous membrane of the vagina. There is a moderate yellow discharge, smears of which show pus cells and gonococci. There is very little refiness of the mucous membrane and no local symptoms of discomfort. In the more savers form the discharge is copious, often thick and of a yellowish-green color. It may be tinged with blood from slight crossons. It causes excentation of the labine and inner surface of the thighs. Micturition may be frequent and painful owing to the involvement of the meethrs. If a small speculum is introduced and the parts examined with

a good light, the extent and severity of the disease can be determined. It is usually seen that the inflammation is a general one affecting the methra, vagina, hymen, and the cervix uteri. The parts are intensily congested, granular in appearance and the purulent discharge may be seen coming from the cervix. With these severe local symptoms there may be in the neuto stage some constitutional symptoms as in the adult, But the cases seen in little children are seldom of this severe form.

In the most severe cases, usually seen in girls past the age of six access years, the inflammation may involve not only the cervix, but the entire endometrium; it may extend to the Fallopian tubes and rem the pelvic peritoneum. Cases of this severity may be seen, though very rarely, in children of only three or four years. We have never met with them in infants. Swelling and suppuration of the inguinal glands are very rare. Other complications are conjunctivitie, arthritis, endo- or pericarditie, meningitie, and proctitis. Conjunctivitie is surprisingly infrequent in very young patients. Arthritis is usually multiple and involves especially the small joints of the fingers, teen, wrists, or ankles, but the large joints may also be attacked. Symptoms of pyemia are usually associated. These cases are more fully considered in the chapter on Acute Arthritis in Infants. The diagnosis in all the complicating conditions rests upon the presence of the genecocous. Masturbation is not uncommon in these cases and occasionally it is associated with sexual precocity.

Diagnosis,-A positive diagnosis between simple and gonoeccusraginitis can be made with certainty only by a microscopical examination of the discharge, though in default of such examination an abundant purnient discharge may be assumed to be due to the genecoecus. In simple catarrh the discharge is made up of epithelial and pas cells with quite a wide variety of buckerial forms, chiefit corei and lucilli, occusionally a few diplococci. In generoccus vaginitis the generocci are found in large numbers, and are usually the only bacteria present. To be diagnostic, they should be demonstrated within the pas cells as well as outside them. The gonsescens decolorizes when stained by Gram's method, which fact distinguishes it from the other organisms likely to be present in the vagina. The staining is quite as diagnostic as the cultural characteristics of this organism. Cases of suginitie are to be regarded as suspicious if pus is found and few organisms are detected; in such conditions subsequent examination usually reveals the gonococcus. In our hospital experience the gonococcus cases have outnumbered the simple purplent forms, fully twenty to one.

Since the diagnosis rests upon the microscopical examination of succurs made from the vaginal secretion, the number in which smears are taken is important. A moist swat or a platinum loop may be used, the latter being preferred, or a few drops of a 1 to 10,000 highlorid solution may be instilled into the vagina and withdrawn with a pipette; after evaporating the fluid the residue is stained. The smear should be taken far inside the ragina, preferably through a small speculum, such as a female urethroscope. Unless these precentions are used a good many mass will be missed, especially since smears from the cervia are sometimes positive when those taken from the vagina may be negative. When properly made and examined by an experienced person the results of the examination may be relied upon for diagnosis. In a certain proportion of the cases, usually those of a severe type with constitutional symptoms, a positive result is obtained by the complement fixation test. This reaction is also at times of value in establishing the fact of cure. In cases complicated by multiple arthritis the ganooscens is nearly found by blood cultures, even though the vaginal smears may be negative.

Prophylarie.—The problem of controlling this disease is a difficult one owing to its great frequency, its extremely contagious character, its protracted course, and the unsatisfactory results of treatment. Educational measures come first in importance. Mothers, nurses, social workers, matrons of institutions, hospital and school authorities should all be made acquainted with the prevalence of the disease and the means by which it is usually spread. The attitude of the public toward the problem would be more intelligent if the idea that vaginitis in young children is a venereal disease could be gotton rid of. Even girls themselves who are likely to be exposed, should be instructed as to the dangers of infection and the means of its avoidance. The importance of proper cleansing of the genitalia is the first lesson to be taught. In the home, essential measures of poysention are that an infected person should sleep alone, should wear a vulvar pad of such a sharaster that it can be destroyed, that sheets and clothing should be washed separately from those of the household, and that especial cure he used about both bath tabs and both water and the tellet seat. In the school the greatest Janger is probably from the common toilet; scrupulous cleanliness of this should be assured; only the U-shaped toilet seat should be used, not merely in schools but in all public places. Another chief source of infection being contact with infected companions, this should be limited so far as possible. To make the disease a reportable one and exclude infected children from public schools does not seem a practicable measure, since this would involve the examination of smears from all the girls attending school. The importance of the disease does not justify such radical measures.

It is in institutions for children that the problem of prevention is most difficult and also most important. In all day nurseries, hos-

petals and houses similar means must be employed, viz., the examination of vaginal ensure from every child on admission should be a matter of routine; cases showing the genococcus should not be received into the same word or dermitory with others, and even cases showing only pus cells but no genococci should be quarantimed. In hospitals for children, routine smears should be taken from all female children at least once a week. In no other way is it possible to recognize cases early and prevent ward epidemics.

The attendants, both day and night nurses, as well as the affected children, should be quarantined. Napkins, underelathing, and sheets from the beds of such patients, also their towels and wash-cloths, should not go into the common laundry, but should be first worked in a strung solution of carbolic acid, and afterward boiled. In wards or institutions where cases have occurred, washable papkins should be discontinued and old muslin and absorbent cotton substituted. These are to be destroyed after using. All articles connected with the children's toilet, also syringes, thermometers, etc., should be carefully disinfected. But aften this is not enough. Separate articles should be furnished for each child. The essential measure is a prompt recognition and isolation of the first The danger to life in this disease is not great, and ease in the hospital. is from the serious complications mentioned above, all of which are very infrequent in young children. In very many cases, however, the disease lasts for years even in spote of treatment and the question of the ultimate damage to the general health or, what is more important, to the organs involved must be considered. At present we have not enough knowledge to warrant positive statements upon this point. It is possible that many of these protracted cases ultimately recover spontaneously, or that after long continuance of the disease the organisms present have such a low virulence that their capacity for injury is very slight indeed. The disease is not a new one and it is very prevalent; were the ultimate dangers as great as some have asserted more evidence of this would exist than new appears to be the case. Facts now at hand do not justify the belief that the ultimate dangers from vaginitie in children are great, or in any way companible to acute ganocucus vaginitis acquired in adult life. Some reason for this may be found in the biological difference in the getnesses from adult and infantile cases which has been already referred to.

Treatment.—On account of its very chronic character and its prevalence chiefly among the poor, most cases of vaginitis must be treated in out-patient clinics. Special clinics for such cases should be established in every large city, attached to which should be a visiting name who should see that proper treatment is carried out in the home. To be at all successful local treatment must be thoroughly carried out by a physician and for a long period. The first essential is local releabliness which must be secured by bothing the external organs twice a day with a solution of boric acut or some similar preparation. In spite of the obvious objections to their nee, irrigations are probably the most valuable of the local measures we possess. These should be made duily if possible and through a cutheter whose tip is carried well into the vagina. Boric acid solution or permanganate of potash 1-2,000 to 1-5,000, ishthyst 1-1,000, or hirlibrid 1-10,000 may be used. Following the irrigation local applications should be made every second or third day of nitrate of silver 10 per cent, or argued 30 per cent strength. These should be made with an applicator through some sort of a speculum—the female mothroscope answers very well for small patients—and the child kept upon the back with the thighs in contact for a short time. If the cervix is involved local applications made in the manner indicated are essential if anything is to be accomplished.

Regarding the value of vaccines there is still much difference of ominion. Some writers have reported excellent results while others with considerable experience have seen little benefit from their use. Our own experience is that their effects are very uncertain; that, while in some instances striking improvement has been seen, in the great majority of cases this does not occur. The best results are seen in the most recent. cases. Regarding the value of vaccines in some of the complications, especially arthritis and general sepsis, there can be little question. The autogenous appear to have no advantage over stock vaccines. The divage of vaccines is still empirical. It is customary to give from 50,000,-000 to 75,500,000 as an initial dose, to repeat every five or six days, gradually increasing this to 100,000,000. If no improvement is seen after six or eight injections, their continuance is useless. In connection with the administration of vaccines careful bathing of the external organs should be combined, but irrigations may be omitted. Because of the favorable results sometimes seen, the use of vaccines is to be addied in all recent acute cases of the severe form. The prolonged use of irrigations has serious objections in gurls of seven or eight years or older, in that it tends to develop sexual consciousness and may lead to reasterbation.

On the whole, it must be stated that the results of treatment in cases which have reached the chronic stage by any measures yet proposed are very unsatisfactory, largely swing to the difficulty of controlling the patients for the tedious period of local treatment which is necessary. Relapses are exceedingly common even in cases in which there has

Relapses are exceedingly common even in cases in which there has been no discharge for weeks or even mouths. Of twenty-six cases carefully followed up by Spankling and subjected to thorough treatment. all but two relapsed after variable periods from one to six months. That such cases are reinfections seems improbable. It would rather appear that the disease may have long periods of latency and recrudecence for an indefinite time. It is therefore difficult to say when a given case is actually cured. Under most conditions one is safe in pronouncing a case cared when there has been no discharge for three months after the discontinuance of special treatment, and when smears from the deeper parts continue to be negative.

GANGRENOUS VULVITES (NOMA)

This is the same process as that seen in the mouth and known as cancrum oris. It usually follows one of the infectious diseases, must frequently measles, occurring in patients whose general vitality has been greatly reduced. There is first noticed a tense, brawny induration, the skin being shiny and swollen over a circumscribed area. In the costs of this there soon appears, usually upon one of the labia majora, a dark sircumscribed spot. Day by day the gangrenous area advances, preceded by the induration. It may involve the whole labiant, extending even to the zaters veneris and the perments. These cases are generally fatal. If recovery takes place, it is with considerable deformity of the parts in consequence of the extensive sloughing and cicatrization. As sequely, there may be fistulate, stemais, or attessa of the vagina. The only radical treatment is early excision, and the application of the actual cantery, carbolic or nitric acid.

CHAPTER IV

DISEASES OF THE BLADDER

ENURESIS.

(Incontinuous of Units; Bed-uniting).

Exumes may be due to some mulformation of the genital tract, such as an abnormal opening of the bladder into the ragina, to extraverson of the bladder, or to the persistence of the arachus; in the latter case the urine is discharged from the ambilious. It also occurs in organic diseases of the central nercous system, such as idiocy, cerebral paley, acute meningitis, tensors of the brain, certain forms of myelitis, spans tofids occults, and in injuries of the cord. In many of these conditions there is associated incontinence of feces. Both of the groups of cases mentioned are quite distinct from the ordinary form of incontinence of urine which is seen in chaldhood. The latter is the only variety which will be considered here.

It is in many cases possible to teach infants to centrol the evaruation of the bladder before the end of the first year; usually, however, control is not sequired even during waking bours until some time during the second year, and in some bealthy infants not before the end of the second year. The time depends very much upon the training. If a child during its third year can not control the cuarantion of the bladder during its waking hours, incontinence may be said to exist.

Etiology.—Incontinence of urine may be due to a continuance of the infantile condition, to anything which increases the irritability of the spinal center, or which interferes with the carebral control over this center, or to anything which increases the irritability of the terminal filtinents of the resicul nerves or of those in the neighborhood. The causes of incontinence this may be in the central nervous system, in the nrine, in the bladder, or in any of the adjacent organs.

The causes relating to the central nervous system are in the main those of the other neuroses of childhood; those are atemia, malautration, an inherited nervous constitution, or a condition of extreme nervousness or neurasthenia, the result of the child's surroundings. In such cases incontinence is often associated with chorea, epilepsy, hysteria, headaches, neuralgia, and other nervous symptoms. In these conditions there is assumed to be not only an increased irritability of the nerve centers, but also of the peripheral nerves, accompanied by loss of tone of the vesical sphineter. A similar condition may exist with almost any form of acute illness, this usually, however, being only temporary.

Incontinence may be caused either by a highly acid, concentrated arine when an insufficient amount of fluid is taken, or by the opposite condition, when owing to the drinking of a large quantity of water, often only a matter of habit, the amount of urine is very greatly increased and passed at frequent intervals.

In the blackler itself, cystitus and vestral calculus, although infrequent, should not be overlooked as possible causes. In a few cases, where incontinence has existed a long time, the blackler becomes so contracted, that it will hold only an ounce or two of urine. This condition, although not the primary cause of enursesis, may be enough to continue it.

Local irritation in the neighboring organs may be due to adherent prepace, balanitis, phimosis, or to a narrow meatur. All of these conditions are frequently associated with incontinence. Rectal irritation may be due to pinworms, anal fissure, or rectal polypus; and vaginal irritation to rulsovaginitis or adherent clitoris; but these are rarely the only cause. Often there is incontinence as the result of a combination of several causes, no one of which alone would have been sufficient to produce it. In many cases heredity seems to be a factor of some importance, parents often having enforced in their childhood from the same condition; quite frequently two and sometimes even three children in the same family are affected. In many cases the condition seems to be mainly the result of habit, and in all cases babit is a potent factor in continuing the incontingnee, sometimes after the original exciting cause has been removed. Prequently no adequate cause can be found. Both seems are about equally liable to enurses; it may be seen in all ages up to pulerty and even to adult life.

Symptoms.—Enursesis may be necturnal or diarnal, or both. Of 184 cases, 73 were noctumal, 9 diamed, and 102 were both nocturnal and diarnal. Cases differ greatly in severity. Incontinence may be habitual. occurring every night, often several times during the night, and frequestly during the day; or it may be only occasional under the influence. of some special exciting cause, when it continues a few days or works until the cause is removed. In a considerable number of cases, the condition lasts from infancy until the sixth or seventh year. It may even routime antil polerty; but it generally ceases at that period, unless its cause is mechanical or depends upon some organic disease of the brain or cord. In ordinary courses there is never dribbling of the urine, but usually a contraction of the walls of the bladder follows almost immediately upon the desire before the patient can make his wants known or reach a convenient place for micturition. At night the same thing may occur without wakening the child, the contraction being of purely refer origin.

Prognosis.—The condition is usually hopeless when it depends upon organic disease of the brain and cord; also in cases due to malformation, anless these are anomable to surgical treatment. In the ordinary cases seen, the prognessis depends upon the age of the child, the duration of the symptom, and the nature of the exciting cause. In children of from three to five years a cure can in most cases be accomplished with proper management. These who are older are much less amenable to treatment, reperially if the condition has persisted since infancy; but if the incontinence has begun after seven or eight years of age and basted but a few weeks or months, the authors in much more encouraging. There are, however, some cases in which no other cause than labit can be discovered which resist all treatment, the condition finally censing spontaneously about puberty; rarely does it continue beyond this period.

Treatment.—The first indication is to remove the same, when one can be found. If there are proportial adhesious, they should be brakes up and critating success removed. If phimosis is present, it should be relieved by circumcision. If stone in the bladder is suspected, as it should be when the incontinence is worse by day and accompanied by

straining and painful spasm of the bladder, the patient should be sounded for stone. Pinworms in the rectum should receive the appropriate treatment by injections. While the local conditions mentioned should always be attended to, the fact remains that few cases are cured amply by relieving them, except those due to vesical calcult. The explanation of this is that liabit is the important factor in keeping up incontinence.

A concentrated urine of high neighty with deposits of urin acid is an indication for alkalis and the free use of all fluids, especially water. On the other hand, when there is passed a large quantity of urine of low specific gravity, the amount of water and other fluids should be greatly restricted. During the night water should be furbiblien. In these cases the incontinence is often simply the result of the polyuras, which in turn depends upon polythpsia.

In most cases the condition is purely a habit, often associated with other habits which indicate an unstable or highly susceptible nervous system. It is therefore of the greatest importance that a proper general régime should be instituted. Care should be taken to accure for the child a simple, natural lide, with no overtaxing of the nervous system at home or in school. Every cause of unnatural excitement should be avoided. Early hours and plenty of sleep should be insisted upon. Certain articles of diet are to be avoided, and coffee, tea, and beer should be absolutely prohibited. Sweets and all highly sensoned food should be very sparingly allowed, or not at all. The exclusion of meat from the diet seems to us to be of no special advantage. Measures directed toward improving the general muscular and nervous tone are of the greatest importance. Anemia, malnutrition, indigestion, and constipation should each receive careful attention.

Punishments, whether corporal or otherwise, do little good, and usually they are barmful. Rewards are sometimes more efficacious than any other means of treatment. One should first find out what it is that the child desires most—a new doll, a bicycle, etc.—and allow him to have it if the bed is dry, taking it away if it is not. A reward of five cents for every dry night sometimes works marvels. Any measures that produce a marked impression upon the mind of the child sometimes have a beneficial effect. The inspiring of confidence that the physician will bring about a cure is oftentimes the most efficacious method of treatment. Bad-tasting drups and mechanical measures, such as the passing of counds, probably over their occasional encess to the mental impression that they produce.

After all local and general causes which can be discovered are so far as possible removed, there remains the large majority of the cases of somests in which the condition is simply the continuance of a bad habit. To break the habit, training is of the first importance. The regulation of the amount of fluids is indispensable. Fluids should be given freely up to 4 P. M., but those who have nocturnal incontinence should have no fluids after that hour, a dry supper being given before retiring. These children are often beavy sleepers and the distration of the bladder does not produce a sufficient impression to waken them. Training should be begun during the day by voiding at regular intervals. and gradually lengthening the interval to accustom the bladder to distention. At night also the child should be waloued regularly at certain hours to said his urine. This should be done by an alarm clock if necessary; e. g., a child who is put to bed at 7 is at first walened at 10 r. at. and at 1 and 4 and 7 a. M., a record being kept of the times when the hed is found wet. When he goes three hours regularly at night without voiding, the time is lengthened to three and a half and finally to four hours. A child can in this way negally be trained in a few weeks to hold his urine with but one waking from 10 p. m. until morning; and in a few months this can be omitted. The number of cases which can be permanently cured by such simple means is most surprising. The faithful cooperation of the mother or nurse is essential to make the cure persument.

The measures described—removal of local causes, improvement of the general health, the institution of a proper regime and training—constitute the most important part of the treatment and in the majority of cases suffice for a cure. Drugs are at times useful as accessories; alone they sedden cure and, on the whole, they are disappointing. Belladonia is the most effective one. Atropia, either in solution or in tablet form, is the most convenient method of administration. For necturnal incontinence, 1-1,000 of a grain for each year of the child's age up to seem years is a suitable dose. A child of five would thus be taking 1-200 of a grain. At first, a single dose should be given at bedrime; after a few days a second dose may be given three or four hours earlier; still later a dose may be given at 1 p. M., 7 p. M., and 10 p. M. To push the drag further than this may cause much discomfort and is of doubtful advantage. After the habit is under control, the drag should be continued for some time and the dose reduced.

Strychain is sometimes advantageous when there is diurnal as well as nocturnal incentioence, for under these conditions there is usually a lack of tone in the sphincter, as well as increased irritability in the mucous numbrane of the bladder. Full doses are necessary; beginning with 1-100 of a grain twice daily it may be gradually increased to 1-50 of a grain three times a day to a child of five. Intelligent, systematic training is the most important of all measures for the relief of this very annoving condition.

VESICAL CALCULUS

Vesical calculus is a very rare condition in children in New York. The nucleus of the calculus is usually a renal calculus which has passed the ureter, but has been presented by its size from going farther. Stone in the bladder is extremely rare in infancy, probably awing to the fluid diet, but it is not infrequent in children from two to ten years of age. The most common variety of calculus at this time is the uric-acid.

The symptoms in children are somewhat different from those in adults, and the condition is often overlooked. There is frequently pain spon micharitian, especially at the close of the act, which may be felt at the end of the penis or in the perineum. There may be a sudden stoppage in the flow of urine. The straining often leads to rectal tensomus and even to prolapse. This complication is so frequent that, in a case of persistent prolapse, stone should always be suspected. Incontimence of urine is a prominent, and often the principal symptom; in many cases it is noticed only during the day. The urinary changes are not generally marked; bemeturia is rure, and mucus and pus are infrequent and in small quantity. The genital irritation near lead to the habit of masterbation. A stone of any considerable size may often be felt by a himmual examination, one finger being placed in the rectum and the other hand above the pulses. This is easier in males than in females, but it is not very trustworthy, and not conclusive when it gives a negative result. A positive diagnesis is made only by exploring the bladder with a sound or hy the X-ray.

The treatment of calculus is purely surgical.



SECTION VII

DISEASES OF THE NERVOUS SYSTEM

CHAPTER I

The Weight of the Brain.—From ninety-eight observations made in the post-mortem room of the New York Infant Asylum, the following were the average weights noted:

At three months.		 21 oz.	(992 g	James.
At six months.		 2514 11	(712	- 1
At twelve month		3215 "		
At two years.	1000	 35 -	7230	H 1

The following are the figures given by Boyd and Schiller.

Acr.	Make		Temales.	
, AUS	Onnomi.	Grand	Outers	Gruns
At birth (full term).	1116	330	10	253 450
Under three months From three to six months	17/4 21 27 33	602 776	10 16 20 26 30 35	560
From erc to twelve months.	27	776	26	560 727
From one to two years	-33	941	30	843 990
From four to four yours From four to seven years	40	1,138	40	1.133
From seven to fourteen years.	46	1,301	4015	1,151
From fourteen to twenty years	4514	1,374	44	1,244

At hirth the weight of the brain to that of the body is nearly 1:8. During infancy and childhood the following is the ratio, according to Bischoff; during the first year, 1:0; the second year, 1:14; the third year, 1:18; at the fourteenth year, 1:15 to 1:25; in adult life it is 1:43.

The Spinal Cord.—The weight of the cord to the weight of the body at hirth is 1:500; in adult life it is 1:1500. According to Kelliker, the spinal cord and the vertebral column are the same length until the end of the third menth of fetal life, there being at this time in rainfu equina. At the minth mouth the lower end of the ourd is opposite the third lumbur vertebra; in the pluft it is opposite the first.

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Some Peculiarities in the Diseases of the Nervous System in Infancy and Childhood.—The relatively large size, the rapid growth, and the immutarity of the brain and cord during early life, explain much that is peculiar to the nervous diseases of this period.

At this time, apparently trivial causes are enough to produce quite profound nervous impressions, because of the instability of the nervous centers and the greater irritability of the motor, actsory, and vasomator across. These are conditions which are very much increased by all disturbances of matrition. These disturbances may be manifold in character, but they lie at the root of very many of the neuroses of early life, e. g., extreme nervousness, disorders of sleep, stattering, shores, incontinence of urine, betany, and convulsions. The great liability to convulsions depends not only upon the greater mutability of the peripheral nervo, but upon the instability of the nervous centers and the lack of inhibition over the motor gaughton cells of the spinal cord. The nervous centers are more easily exhausted than later in life.

Another peculiarity is the serious consequences which often follow reflex irritation, although this is rarely the only factor in the case. Conditions which in adult life produce almost no effect may in infancy be the cause of most alarming symptoms.

As a third point of importance may be mentioned the grave purmanent results which often follow relatively small organic lesions. A good illustration is seen in the lesions which produce or shral hirth-poly. Here the damage is only in small part the immediate effect of the honorrhage, for this often is not great, but it is the interference with the development of certain parts of the sortex that makes the condition as serious.

From what has been said, it follows that the hygiene of the nervous system is of the utmost importance in infancy and childhood. It is essential for the healthy development of the nervous system that all stimulants should be avoided—not only too, coffee, and alcohol, but undue and unnatural existement, the effect of which in infancy is almost as serious. A normal development can take place only in the midst of quiet and peaceful surroundings, with plenty of time for rest and sleep. The conditions of modern life, especially in cities, are such that these laws are almost invariably violated, and the consequences of this are seen in the marked and steady increase in nervous discuss among children of all classes.

CHAPTER II

GENERAL AND FUNCTIONAL NEEVOUS DISEASES.

CONVULSIONS:

Att. young children, but especially infants, are entremely prone to convulsive disorders. In certain infants, especially show who are rachitic, this susceptibility is much heightened.

Under the head of convulsions are included attacks of acute transient nerrous disturbance, characterized by insulintary rhythmical spasm of the muscles, either of the face, trunk, or extremities, or all of them, negally accompanied by has of consciousness. They may be regarded as "motor discharges" from the cortex of the brain.

Etiologically, convulsions may be divided into those of organic and those of functional origin according as to whether a pathological lesion is at is not demonstrable. It must not be overlooked, however, that what we now consider functional may, with improved methods, be shown to depend upon an actual change in the tissue of the brain. Under the head of organic, or those due to direct irritation of the cortex of the brain, may be included all convulsions occurring with the narious forms of cerebral disease. The most frequent are meningitis, meningeal or cerebral homorrhage, tumor, absence, hydrocephalus, embelism, and thrombonic. Developmental defects of the brain, especially microsophalus, are frequently the cause of repeated convulsions that are usually classed under epilepsy. Convulsions due to organic disease may be found at any time during infancy and chabitood. Because of their dependence upon transmition at birth fiber are frequent in the first few weeks of life.

Conculsions functional in origin are, in the overwhelming majority of cases, dependent upon betany which may be either active or latent. It is only in the last few years that this has been sufficiently recognized. As will be emphasized under Tetany, the symptoms of this disease and the irritation of the nervous system accompanying it are not usually manifest before the end of the first half year. For this reason, functional convulsions are much less frequent during the early months of life.

It has been held that the most important prelisposing cause of conrelators in inflancy is the metabolity of the nerve centers, which is dependent upon a lock of development of the voluntary centers of the cortex. It should be emphasized, however, that while convulsions of functional origin are exceedingly seminen in inflancy, they are not so in the first three or four months of life when instability of the centers might be assumed to be the greatest. It is quite evident that the instability depends not upon the normal insufficiency of cerebral development, but upon the acquisition of Setany, which causes cerebral instability.

It has long been held that convalsions were caused by materials absorbed from the gustro-intestinal tract. It is certainly true that onerfeeding or indigestion may excite convulctors. This is usually, however, in children suffering from tetany and it is very likely that the convulsions are not due to any specificity of the material absorbed, but that any irritation to the child's nervous system is birdy to be followed by convulsions. Convulsions are sometimes seen, it must be admitted, in infants when no evidence of organic disease can be detected, nor any symptoms of tetany and no hyperexcitability of the nervous system as shown by electrical commutation. The cause of these is not clear.

Convulsions are apparently at times of toxic origin. They may result from conditions like aremia and asphyxiz and also at the coset or in the course of surious infectious diseases. They are more frequent in children who have or have had tetany, but may be found without any evidences of this. They are very frequent at the onset of certain diseases, particularly presumonia, seatlet fever, malaria and acute indigestion. In pertussis, which, of all the infections diseases, is the one in which convulsions are most frequent, several factors may be present: asphyxia, due to a severe paroxysm, excelual congestion or homorrhage resulting from such a paroxysm, or simply a peculiar susceptibility of the patient brought about by the disease itself. One attack of convulsions, whatever the cause, renders the patient more liable to a second attack and when there have been several, they occur from causes which are less and less marked.

An infrequent cause of convulsions in young children is an enerphalopathy due to lead postoning. We have seen four such cases, three of which were fatal. The postoning was caused in each instance by the child's nibbling and avallowing the point from his crib or furniture.

Convolutous ending fatally are not infrequently associated with culargement of the thyrms gland. We have seen many such where there was found at autopsy great enlargement of the thyrms, and the lymphatic structures. Some of these infants were previously healthy; some were rachitic. The similarity of all these cases indicated that the convolutions were in some way associated with the enlarged thyrms, but the exact explanation of such cases is not understood. In infants who die during convulsions the brain may be the seat of punctate homorrhages, and sometimes of more extensive ones. The lungs are also deeply congested, and the right boart is generally distended with dark clots. The other lessons found are accolental.

Symptoms.—In some cases prodromal symptoms are present, such as extreme restlessness, irritability, slight twitchings of the muscles of the face, hands, feet, or credids. More frequently, however, the attack comes. quite suddenly with little surning. Usually the first thing noticed is that the face is pule, the type fixed, sometimes rolled up in their orbits; in a moment or two, convulsive twitchings begin in the neucles of the ege or face, or in one of the extremities, which usually rapidly extend until all parts of the body participate. In most cases the convulsions become general, but they may remain unilateral even when not due to a local cause-a point which is often forgotten. The contraction of the facial muscles causes a succession of grimness; the neck is thrown back; the hands are elenched; the thumbs hursed in the palme; and a quick spasmodic contraction of the extremities occurs. There may be some frothing at the mouth, and in all true convulsions there is less of consciousness. Respiration is feeble, shallow, and may be spasmodic. The pulse is weak; it may be slow or rapid; often it is irregular. The forehead is covered with cold perspiration. The face is first pale, then becomes slightly blue, especially about the lips. Unnutural ratifling sounds may be produced in the larvax. The bladder and rectum may be evacuated. The convulsive movements consist in an alternation of flexion and extension occurring rhethmorally. All varieties of tonic and elonic spasm may be seen, and in all degrees of severity. The contractions of the two sides of the body are usually synchronous. After a variable time, from a few moments to half an hour, the convulsive movements gradually become less frequent, and finally cease altogether, usually leaving the patient in a condition of stupor. They may recur after a short time or there may be left one attack. A period of general relaxation usually follows the convulsive sessures, frequently accompanied by marked evidences of prostration. Transient paralysis, apparently due to exhaustion of the nerve centers, is not an uncommon sequel.

Death may take place from a single attack; this, however, is rare except in very young infants, or those with status lymphaticus. There may be no sequel to the consulsions if the cause is a temporary one, or they may produce some serious brain lesion, particularly meningcul hemorrhage. Death from conventions is generally due to asphyxia, or to exhaustion from the rapidly recurring attacks. Many cases recover in which the children for several minutes had the appearance of being morihund.

One attack of convulsions is very apt to be followed by others, especially if tetany be the come: The longer the interval which has passed, the less likely is there to be a repetition, especially if the child has passed his third year.

Biagnesis.—There can rarely be any difficulty in recognizing an attack of convolutions. The difficulty counts in determining with which of the many possible exciting causes we have to deal in the case before

us. If it comes with acute symptoms does it depend upon a cerebral busin, or does it mark the unset of some other scute disease? Is it due to tetany? If there are no acute symptoms, is it spilepay? To answer these questions a careful history must be obtained, and all the circumstances surrounding the patient, the character of the convulsions, and all the other symptoms present must be taken into consideration. Tetany is easy to recognize if there is corpopodal spasm, Chrostok's sign, laryngospusm, or Trousseau's sign. If these are absent, it can only be determined by the electrical reactions. Tetany is to be considered the most likely cause, however, in the absence of the evidence of organic reached disease.

In infancy, epilepsy is the least probable diagnosis. In obler children the insportant points indicating that disease are: a history of previous attacks, a distinct area preceding the seizure, or a sudden unset with a cry or fall, biting of the tongue, a deep sleep following the seizure, and, finally, perfect recovery in the course of a few minutes or bours. Convalsions which come on with high fever, even though a patient may have repeated attacks, are seldem epileptic. However, in some cases only prolonged observation can smalle one to decide positively whether or not epilepsy is present.

Convolutions occurring in brain disease, except acute menugitis, are not us a rule accompanied by any marked rise in temperature. Focal symptoms are often present, such as localized paratress or rigidity, changes in the pupils, and strabismus. The convolute movements are frequently limited to one side of the body. It should, however, be forme in mind that unilateral convolutions, even when repeated, do not always mean a local letion, as we have seen proved by autopsy more than mor. In hemorrhage or meningitis, convolutions are likely soon to recur. In tumor they may recur after a longer interval.

Convulsions may be thought to indicate the onset of some arute discase when they occur in a child over two years old, and when they come an suddenly or with only slight permonition in a child previously well; but the most important point is that they are accompanied by a high temperature—104° to 166° F. Acute meningitis is the only other condition likely to produce these symptoms. Whether the convulsions mark the onset of lobar pacumonia, searlet fever, or some other disease, can be determined only by carefully watching the patient's symptoms for twenty-four or thirty-six hours or possibly longer.

In the first weeks of life one may often be in great doubt as to the rause of convulsions. Such attacks may be due to some disorder of the digestive tract, to a recent cerebral being like homorphage, or to a defective brain development. Apparently preforged pressure in a difficult labor may produce temporary, perhaps rirenlatory, changes in the brain

aufficient to cause convenious during the first few days of life. We have seen them in a number of children whom we have had an opportunity to follow for several years. Their physical and mental development has progressed in a perfectly normal manner.

Examination of the arise should not be omitted in any case of consultions of doubtful origin. Asphysia may be suspected in the case of convalsious occurring in the newly born, late in pneumonia, in some cases of pertussis, in spaceholic or membraneous laryagitis, or with laryagespasm. It is altogether improbable that dentition and norms play any part in the causation of convulsions except perhaps that of the slight irritant which is sufficient to excite convulsions in a child suffering from betany.

Encephalopathy due to lead should be kept in mind as a rare cause of convalsions in children. The blue ponetate line in the game can usually be found, though not around each tooth. There is also stippling of the red 16ood-cells. The cerebrospical fluid is under increased pressure, the cells are slightly increased in number and there is a positive reaction for globulin. There is frequently pallor of the optic discs and hemorrhages into the retina may be seen.

In all cases of convulsions occurring in infants in which the cause is not readily apparent, betany should be suspected as the underlying condition.

Prognosis.—This depends upon the cause of the convulsions, and differs with each underlying cause. In general it may be said that convulsions in themselves are seldom fatal unless they occur as a terminal condition. Especially fatal are the convulsions of pertussis and of asphysia when they occur late in any form of larguagest or palmenary disease. The conditions during an attack which should lead one to make a bad prognosis are when the convulsions are prolonged or recur frequently; also the presence of very great prostration, a feeble pulse with cyanosis, or deep stupor.

In the progress one must take into account not only the immediate result of the attacks, but the possible outcome. In a highly nervous or susceptible shild a convulsion often means very little. Permanent injury to the brain, simply as a result of an attack, is very rare. The possibility of epilepsy is to be forme in mind in all cases where children over two years old have occasional attacks of convulsions. The further apart the attacks are and the more definite the saciting cause, the less likely is this to be the case.

Treatment.—Summoned to a child in convulsions, a physician should go at once and remain until the attack has subsided. He should take with him chloroform, a hypodermic syringe with morphin, a soft catheter or rectal tule, and a solution of chloral. In order to treat convulsions

sions intelligently one must have in mind the prominent pathelogical conditions. These are acute cerebral hyperennia, a more or less senses asphyxia with pulmonary congestion, an overtaxed right heart, and a tendency to congestion of all the internal organs. The nerrous centers are in a condition of such unnatural excitability that the slightest irritation may bring on convulsive movements when they have temperarily subsided. The patient should therefore be kept perfectly quiet, and every unnecessary disturbance avoided. Cold should be applied to the hoodbest by means of an ice cap or cold cloths-and dry heat and counterirritation to the surface of the body and extremoties. The time-hanored mustard both causes - much disturbance of the patient that it can avually be dispensed with and the mustard pack substituted. The feet may be placed in mustard water while the child lies in his crib. The mustant pack and footbath should be continued until the skin is well reddened. The degree to which counter-irritation of the skin should be carried will depend upon the condition of the pulse and the symmetric

In controlling convulsions the remedies which may be depended upon are the inhalation of chloroform, chloral per rectum, morphin and magpessum sulphate hypothermically. Chloroform is undoubtedly the most reliable remedy for an immediate effect, and may be used even in the youngest infant. At the same time that it is being administered, chleral may be given. The initial dose should be, at six menths, four grains; at one year, six grains; at two years, eight grains, dissolved in one omer of warm milk. It should be injected high into the bowl through a ratheter, and prevented from escaping by pressing the birtheka together. It may be repeated in an hour if necessary. The effect of the drug is generally obtained in twenty or thirty minutes. If, in spite of the chloral, the outvulsions show a marked tendency to continue as room as the chloroform is withdrawn, or if the spens of chloral has been expelled, morphin may be given hypodermically. When the heart's acbeer is weak, this is probably the best of all remedies. To a well-grown child two years old, A grain may be given; one year old, A grain; six months old, A grain. This dose may be repeated in half an hour if no effect is seen. The bilerance of opium in cases of convulsions is very marked, and sometimes double the doses mentioned may be required. For frequently recurring convulsions magnesium sulphate, hypodermically, is a valuable remedy. It has the advantage over morphin in that it foce not constitute. Eight or ten grains of Epsem sults may be given to an average infant of three or four months, and from fifteen to twenty grains to one of six or eight mouths. It does not act so promptly as does morphis. The dose may be repeated in two hours if necessary. The only other agent of much value is oxygen. We have occasionally seen convulsions which continued in spite of all other treatment yield immeTETANY 677

diately to oxygen. This is most likely to be valuable in cases of convulsions due to asphysia.

In infancy it is wise in every case to irrigate the colon thoroughly with warm water, to remove any possible source of irritation. If there is reason to suspect the presence of muliported food in the stomach, this may be washed out. Much more frequently it is in the intestines, and free purgation by caloned is advisable. If there is high temperature, this should be reduced by the cold bath or pack.

When once under control, the recurrence of the convulsions may be prevented by keeping the patient for two or three days under the influence of chloral with bromid of sedium, the amount of obloral being gradually reduced. If it is badly bome by the stomach and not easily retained by the rectum, either antipyrin or phenacetin may be used with the bromid. As seen as the convulsions have ceased, the cause should be sought and treated.

TETANY

Several clinical conditions, formerly described under different names, are now regarded as manifestations of tetany: arthrograpsess or carpopedal spasms, larguginesse stridulus or largugospasms, holding-breath spells, etc.

Tetany is a disease characterized by an extreme irritability of the nervous system to mechanical and electrical stimulation. It is frequently accompanied by more or less prolonged contractions of the muscles of the extremities. Spann of the glottis and also general convalsions are very common. It was formerly believed that tetany was rather infrequent and was manifested only by muscular spann. Studies by electrical methods, however, have shown that in infancy and childhood the disease is exceedingly frequent and that it may exist without giving any symptoms, i. e., in a latent form. To the latent form of the disease as well as to all the manifestations, the term "spannophilis," or "spannophilis diathesis," has been applied by many.

Etiology.—While tetany is found with the greatest frequency during the latter half of the first and sharing the second year, it is very rarely seen in the first three months of life. It may occur at any time during childhood but its frequency diminishes rapidly with age. Totany is rare in summer and early sutumn, but it is very common in winter and early spring. The association of tetany with rickets is a very close one. Not only is it found at the time of year when active rickets is most common, but almost all children with tetany show some of the symptoms of rickets. While cases are observed in which no rachitic manifestations are present, rickets cannot be entirely excluded, for, as has been stated elsewhere, the first evidences of rickets in the tones escape clinical observation. Symptoms of both rickets and tetany begin to be seen at about the same age. While tetany may occur in the breast-fed, this is relatively infrequent. The disease evidently depends for its development largely upon artificial feeding but occurs even when this has been apparently proper.

Totany seems to be closely connected with changes in the calcium metabeliers, although these are not yet entirely clear. It has been shown in a certain number of patients that with active telany, just as with active rickets, there is a negative calcium balance—more calcium being eliminated than is ingosted with the feed. There has also been found post morters a deficiency in the calcium content of the brain. Marion and Howland have demonstrated a marked reduction of the calcium of the blood of infants with active tetany. MacCallium and Voigilin have shown a deficiency of calcium in the blood of animals with experimental tetany. It is therefore clear that there is some alteration of calcium metabolism in tetany.

The removal of the parathyroids in animals and the occasional accidental injury of these in human surgery produces a condition closely akin to tetany. The work of Erdbeim, Escherich and Yamse indicated that the parathyroids might be discused in tetrmy, the changes consisting in hemorrhages and their remains. Later observations have shewn that these alterations may be found in children who, during life, have given no evidence of betany and also that the glands may be normal when definite tetury has been present. It is us yet impossible to say whether the paratheroids play an important part in the disease. There is, however, sufficient evidence to indicate that they may have some influence upon its production. Triany is at times bereditary. There may be a history of the disease in one of the purents and occasionally families are found with several children who have suffered from tetany, "Acute disease, especially when accompanied by fever, is sometimes the exciting cause. It must be assumed that up to the onset of the acute disease tetany has been latent, the new condition possibling the necessary irritation to make the tetany active. Thus, letany is seen with acude diseases of the gastrointestinal tract, posumonia and the acute infectious diseases.

There are no characteristic pathological changes other than those of the associated rickets. In a certain proportion of the cases alterations in the parathyroids are found. One or more of the four glands may be colorged and red as a result of extravasation, or the changes may only be evident under the microscope and consist in small bemorrhages, and the remains of hemorrhages.

Symptoms.—One of the most characteristic and striking is carpepedal space. It is, however, by no means the most common manifestaTETANY 609

tion, and is seen in only a small percentage of the cases. The spassi of the hands and feet may develop abruptly, or it may be preceded by sensory disturbances. The upper extremities are usually first affected and both sides equally. The position is very characteristic: The fingers are



Pro. 86.—Terant, escention that Characterments: Properties or the Harde are Pers., In a child two years sid.

flexed at the metacurpophalangeal joints and the plulanges extended; the thumbs are adducted almost to the little finger; the wrist is flexed acutely and the hand drawn somewhat to the above side. If the spann is very marked no motion is allowed at the wrist. The feet are strongly extended, sometimes in the position of equinovaries. The first phalanges of the toes are flexed, and the second and third rows extended; the plantar surface is strongly arched and the dorsum of the feet is very prominent, standing out like a cushion. The typical position of the hands and feet is well shown in Fig. 86. Motion at the elbow, shoulder, hip and knee is generally free. The spasm in many cases is limited to the hands and feet; more rarely the muscles of the thigh, usually the adductors, may be involved. In rare cases the muscles of the trunk or the face may be affected. The spasm can be voluntarily overcome to a certain satent; thus a child may open his hands to grasp objects or feed himself. As soon as active motion ceases, the hands resume their former characteristic attitude.

Evidences of pain are frequent; it may be so severe as to cause children to cry out. Pain may be induced by any attempt to overcome the spasm, and semetimes it is constant. There is no loss of conscioueness and no fever. The duration of carpopedal spasm may be from a few hours to several days. The muscular contraction is generally continuous, although there are often periods of remosion. There may be only a single short attack. Of this we have seen several striking instances. One child seven years old who had always been well was operated upon for enlarged tonsils. The night following operation she crood out with pain and her hands and feet were found in the typical position of tetany. In four or five hours this completely disappeared and dol not return. This was the only symptom of tetany that she over manifested. Carpopedal spasm may come on spontaneously but is more frequently found in the coarse of some febrile illness. It is found in no other disease and is diagnostic of tetany.

Disturbances of respiration are exceedingly common in tetany. The most typical of these is spains of the glottis or laryngospasm. This consids in a contraction of the laryngeal muscles of such intensity as partially to obstruct inspiration or for a time to arrest it. When the obstruction is partial there is a very characteristic crowing sound with each inopiration, especially if the child is disturbed or crying. There may be a succession of these sounds, followed by an intermission, or the condition may last in a mild form for several minutes or hours. The severe attacks of obstructed respiration usually come on suddenly. The child throws back his head, the face becomes pale, then fivid, and for the time there is complete arrest of respiration. This continues for a few mements, during which the cyanosis deepens, and the child seems in great distress, making violent efforts to breathe. If the paroxyam is very severe, the asphyxia may be so great as to lead to loss of consciousness, or the attack may terminate in general convulsions. It may even be fatal. In less severe attacks, after fifteen or twenty seconds the muscular spasm relaxes, the glottle opens, and a long, deep inspiration occurs, with the production

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of a crowing sound. Such forms of spaces often come on without evident cause, and may be repeated from two to twenty times a day. Between them the condition of the child may be normal or carpopedal spaces and other evidences of tetany may be present. Not all the paroxyens are equally severe. A child may have in the course of a day a great many mild attacks, but only a few severe ones. General consultions are seen in over one-third of the severe cases. Laryngospasse is most common in children from six to fifteen months of age.

Attacks closely related to those which have just been downled are met with in which respiration entirely ceases for a time; there are tenperarily no attempts at inspiration. It has been assumed that the dia-phragm participates in the spasm. Attacks with temporary arrest of respiration are seen most frequently in the latter part of the first and during the second year, but beginning in infancy they may room from time to time until the age of four or five years. They affect children of an extremely nervous type. Several attacks may occur in a single day, or they may occur at intervals of arreral days or weeks. In encoptible children almost any form of excitement may precipitate one. They are often known as "helding-breath spells." In older children by far the most frequent exciting sauses are temper and fright. If anothing is attempted to which the child strongly objects, e.g., a cold bath, inspection of the throat, or taking away a toy, an attack may ensue. The child's face becomes finded, then hirid; there is general rigidity of the trunk and extremities, but very rarely clonic squeens. This rigidity is usually followed by complete relaxation with loss of consciousness. The entire attack usually lasts about half a minute. There may be a crowing second as the child catches his breath or there may be none. After a few minutes of quiet the child gets up and in a short time is apparently as well as guer. Many of those who are subject to attacks of this sort sooner or later have one or more general convulsions, but in some only the mild attacks are seen though they may recur at intervals for years. Death occasionally occurs with severe attacks, there being no renewal of responstion and all attempts at resuscitation failing.

Leilerer has described a complex of pulmonary symptoms closely simulating asthma. This he has termed byoxcha-tetanic. It is not clear that the symptoms which he describes are necessarily dependent upon totany.

General convulsions are exceedingly common with tetany in infancy.

After that they are less frequently seen. They differ in no respect from
those that have been described in the previous shapter. The more frequent the convulsions, the milder they usually are. From the character
of the convulsions alone, it is impossible to differentiate them from
epilopsy. They may occur without any exciting cause or the least stimus-

his may be sufficient to cause an attack. Thus we have seen a child who repeatedly lind consultions whenever cold was applied to the skin. The number of attacks may be very great. In one case that we saw, an infant during the latter part of his second year had, during six months, over 3,500 distinct attacks of convulsions. For a considerable period they reached the almost incredible number of 80 a day. After improvement occurs, the number may gradually diminish or more frequently they may cease almost at once. Death is infrequent during a convulsion but occasionally occurs, apparently from exhaustion, when severe convulsions are frequently or minterruptedly repeated.

When tetacy is suspected, three confirmatory signs should be sought: Chrostek's sign or the facial phenomenon, Trenseau's sign, and Erb's sign. Chrostek's sign consists in a momentary contraction of the number of the face when a branch of the facial nerve is tapped with the percussion hammer or with the fagor. The nerve may be tapped anywhere, but usually best about the middle of the check. The contraction may affect only the mouth and the also mai, or it may incolve any of the muscles supplied by the nerve. This sign is not found in the first two years of life, except in cases of tetany. Later, it is of more frequent occurrence and less reliance can be placed upon it as an evidence of tetany, particularly after the fifth year. This mich, however, maintains that it always indicates tetany. But it is found in such a large properties of older children in whom no symptoms or history of tetany can be obtained that it is generally believed to indicate in them only a neurotic constitution.

Transcens's sign is elicited by pressure by the hand or a landage upon the blood vessels of an extremity with sufficient force to stop the circulation temporarily. The sign is most easily elicited in the upper extremity when pressure is made about the elbow. The radial pulse should be obliterated for several minutes. Then the hand may assume the typical position of carpopedal spaces. The sign is often absent in well-marked tetany, but when present is to be regarded as positive cridence of tetany.

Eeb's sign or the quantitative reaction of the server to the galvanic current." Muscular contractions are produced by the application of the

[&]quot;For the electrical determinations a galvanic battery with a milliamplementer graduated in fifthe up to five milliamplems in recovary. The measurements are usually made upon the percental move. The large indefensat electrode should be placed upon the abdamen, the atministing electrode upon the permeal move in the outer part of the poplitual space must the head of the fibrills.

The rethoded electric contraction is often obtained with a current less than 5 militaripiess in strength in normal children under see mostle of uge, and after this time it is regularly present with a current of this strength or a weaker see No evidence in regard to tetany may be obtained from the C.C.C. The cooled

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galvanic current to the nerves. These contractions occur with the making or breaking of the current and are called "closing" and "opening" contractions, respectively. The nerves react differently to the different poles and also to the making or breaking of the current. Age also has an important influence in the character of the electrical response. The nerves of the newly hore and of infants during the first year are less responsive to the current than those of children who are older. The excitability increases with age up to about five years, after which there is little if any difference between the child and the sould. Closing contractions occur in early childhood with a weaker current than do opening contractions.

In the first six months of life any contraction with a current of less than 5 milliampères, except that of cathodal closure, points to telany; while an opening contraction, either cathodal or anodal, with a current weaker than 5 m, up. is positive evidence of tetany.

Under two years of age an A.O.C. with a current of less than 5 in ap, and weaker than one which will cause an A.C.C., is presumptive but not positive evolunce of tetany. C.O.C. or C.C. tetanus with a current of less than 5 in ap. in a child under five may be considered hyperexcitability due to tetany. Repeated measurements upon the same child aften give different results in the course of a few days. For this reason several electrical examinations are frequently necessary to determine or exclude tetany.

closure untailly requires more than 5 m, up of current with infants less than six months of age. From that time up to two yours the A.C.C. is frequently, and after two years regularly, obtained with a current less than 5 m, up attempts. An A.C.C., therefore, with a current of less than 5 m, up, is suggestive of tellary andy in the first six months.

The smolid opening contraction in the first six months of life occurs with normal shifting only with a current of more than 5 m, up, strength and up to two years it almost always requires a current of more than that. It also usually requires more current to produce an AOC thus su ACC until the second or third year. After five years of upe the AOC is required obtained with a current of lines than 5 m, up, and less than is required to produce an ACC. An AOC therefore in the first six menths of age obtained with a current less than 5 m, up, is strong exidence of tetatry and under two years of upe is suggestive of tetatry, especially if the AOC takes place with a current less than a required to produce an ACC. This was called by von Pirquet unodal hyper-nacitability." We cannot regard it as more than highly suggestive of tetatry after six menths of ups, for it sometimes occurs with children that are apparently entirely normal. After two years of upe it is often present and after five years of upe regularly so with normal children.

A exchange species contraction or cathodel closing tensors, consisting with a current of less than 5 m, up, in children under five years of age, is positive existence of tenany. After that time such values may occasionally be found with cause normal children.

The conception of "latent" totany was gradually reached when it was approximated that muscular spasm of the extremities, laryngospasm and general convulsions were all symptoms of the same basal disorder. The electrical reactions also were shown to be in many instances the same in children that had suffered from no spasmodic symptoms, as in those who were the subjects of frank totany. If the former were followed carefully it was often noticed that, somer or later, consulcions, laryngospasm or carpopedal spasm developed. It is therefore apparent that there is an instability of the nervous system that, without electrical measurements, may exist misospecial until anddenly it becomes clinically esistent. Electrical measurements upon a large number of children in hospital and out-patient practice have shown that latent tetany is a frequent condition and that undoubtedly only a small percentage of these children show symptoms by which the disease is recognizable.

Various other symptoms have been ascribed by writers to tetany. Thus, Brahom has emphasized spasm of the pylorus producing tensiting, of the intestines, causing pain and meteorism, and of the anal sphineter leading to obtinute constipation. The occasional retention of urine in totany has been referred to spasm of the vesical sphineter. The fatal softener in some cases of general convolutions or those with laryngospasm it is claimed results from totany of the cardiac musculature. The relation of all of these conditions to totany is very doubtful.

From what has been stated it is evident that the variations in the course of the disease may be extreme. Tetany may entirely escape observation or it may give symptoms for months or even years. There is a surprisingly close connection between the condition of the bowds and the symptoms of tetany. In most patients tetany is aggravated by the existence of constigution. A sharp attack of diarrhea or free purgation by medicine regularly causes a diminution and often a complete disappearance of all symptoms including the abnormal electrical irritability. As the result of dietetic treatment, a marked diminution in the intensity and frequency of the attacks may be observed. They often cease altogether in a short time. Other cases are observed, however, in which improvement is very slow. In these children that suffer from malnutrition a proper growth and gain in weight may be difficult to obtain.

Diagnosia.—This may be easy or so difficult as to be possible only after prolonged observation. Carpopedal spann, larynguspasm, Troussean's sign and Chvostek's sign under five years, are pathognomenic symptoms. But in perhaps the largest number of children with tetany none of them is present. The electrical reactions are usually conclusive, but at times may be of little assistance. If an infant with no evidences of an organic brain lesion has repeated attacks of convulsions tetany should TETANY 685

always be suspected. If there are symptoms of rickets and if the attacks are frequent the probabilities of totany are greatly increased. The chief difficulties in diagnosis are with older children who suffer from occasional convulsions. It may be almost impossible without prolonged observation to decide between opilepsy and tetany. Electrical reactions at this age offer little assistance. The older the child the greater are the chances in favor of opilepsy.

Prognosis.—The prognosis of tetany varies greatly with the age of the patient, the type of the disease and its arterity. The prognosis of latent belany is always good, with proper treatment. In general, the yearger the patient the more severe the manifestations of tetany are likely to be and the more difficult to control. After two years, except in markedly rachatic children, the prognosis as to life is always good. The chances are always in facur of resovery when there are only occasional attacks of general convulsions. With frequently repeated convulsions there is danger to life, not only from the convulsions themselves, but from the frequent association of access attacks of larguagement. This must always be looked upon as a dangerous manifestation of tetany and infants may die during such attacks.

Tetany complicating gastro-intestinal or any scate infectious disease makes its prognosis less favorable. According to Thiemich and Birk, the mental development of children who have suffered from severe totany is aften greatly retarded and, in many cases, permanently interfered with. The physical development also suffers. More observations are required definitely to settle this point. It is apparent, however, that totany may leave permanent effects.

Treatment.-Prophylaxis should be emphasized. Tetany does not often occur with breast feeding. Maternal narring is not only the best preventive, but feeding with woman's milk is also the best means of stopping the further progress of tetany when it has once developed. It does not, however, rapidly cure the disease. With infants under eight menths of age who give symptoms of tetany woman's milk should be supplied if possible. Treatment should be directed not only against the manifestations of totany but also against the fundamental metabolic disturbance upon which they depend. The treatment of this basal condition is the treatment of the associated rickets. It differs in no respect even though we recognize that the two conditions are not similar. This has been discussed in the Chapter on Rubets. The only exception to this general statement is that during the presence of attacks of convulsions and laryngospasm or carpopedal sposm it may be advisable to remote all cow's milk temperarily from the food. While it is true that overfeeding with cow's milk apparently causes and certainly argustates tetany, in the event that breast feeding is impossible, com's milk cannot

he altogether removed from the diet, except for a short period. There is no advantage in excluding it for a long period. The most satisfactory results are generally obtained when feeding is carried on according to the indications afforded by the child's digestive symptoms. There is a distinct advantage in providing a mixed diet with a minimum amount of milk as soon as the child's digestion will allow it.

The active symptoms of tetany may be controlled by calcium chlorid; douge, 50 to 60 grains daily. It should be continued for several weeks in gradually diminishing doses. There can be no doubt that the prolonged administration of cod-liver oil and phosphorus is beneficial in

very many of the cases. They are to be used as in rickets.

General convulsions are to be treated according to the methods given in the previous chapter. Chloroform, chloral, morphia and magnesian sulphate are all useful and are to be employed for rather different indications. In an average case in an infant the last mentioned remedy is to be preferred. It is given subcutaneously in doses mentioned under Convulsions. If the convulsions are frequent it is advisable to withdraw con's milk from the diet entirely for a time. Graels may take its place for several days. When milk is again included in the diet it should be asided very gradually and in minimum amount.

Laryngospaem, if severe, requires the administration of calcium bromid by mouth or chloral by rectum until the frequency and severity of the attacks are controlled. Antipyrin at times seem to be more effective than bround or chloral. If during attacks there are no efforts at inspiration, artificial respiration should be performed and possibly intulation may be of value. The dietetic treatment should also be the same as when general convulsions are severe. Carpopedal spasm is often relieved by prelonged warm baths or by the application of warm compenses. Essmids, chloral or antipyrin are also to a certain extent useful in relaxing the spasm. Latent tetany requires no treatment other than the general dictetic and hygicaic treatment directed toward the correction of the basel disturbance of metabolism.

EPILEPSY.

Epilepsy cannot be considered a sharply limited disease. Rather it is to be looked upon as consisting of certain symptom-complexes that are frequently repeated and arise as the result of widely different cause, some known and some unknown. Moreover, these symptom-complexes are to a certain extent interchangeable. Epilepsy is manifested by repeated general or localized miscular spasm with or without less of consciousness and by peculiar mental states, the so-called "equivalents."

A distinction must be made between cases of so-called "uliopathic"

epilepsy, or those without gross anatomical tosis, and those which are secondary to a definite lesion of the brain, such as tumor, scleross or abscess. Convulsions of the latter character are designated as "symptomatic" epilepsy, and are discussed in connection with the various discusse in which they accur. The nature of the attack may, however, be identical in both varieties, and may not differ from an ordinary attack of convulsions or estampoia. The proportion of idiopathic cases in children is not so large as was formerly supposed; many of these have been shown to depend upon beings convenienced, particularly mild infantile cerebral paralyses.

Ettalogy .- From a consideration of 1,450 cases of epilepsy, Gowers states that 12 per cent begin in the first three years of life, and 46 per cent between ten and twenty years. The greatest tendency to the development of the disease is shown about the time of palierty. Females are rather more liable to be affected than males, although the difference in sex is slight. Heredity plays the most important rôle in the production of the disease. It is estimated by various authors that from 35 to 65 per cent of epileptics come from epileptic families. Echevierra investigated the families of 135 epileptics and found that of their 531 children. 78 were epileptic and that 106 manifested various forms of nervous and mental diseases. The influence of alcoholism in the purents upon the production of epilepsy cannot be estimated with certainty. It is hardly to be doubted that it is a factor of importance in at least a certain percentage of cases. Syphilis also must be looked upon as the cause of some of the cases. Whether, in the absence of definite anatomical lesions. it so affects the brain as to lead to epileptic segures cannot be stated at the present time. Further studies with the goodance of the Wassermann reaction are necessary to decide this question.

It was formerly believed that infantile convolsions were not infrequently followed by epilepsy in later years. There are numerous causes for conculsions in infancy. By far the greatest number not due to organic brain disease depend upon tetany. Not sufficient time has elapsed nor sufficient observations been made since the more recent knowledge of betany to say whether it is likely to induce opilepsy. There is no good reason, however, to suppose that it does. Convulsions in infancy that are followed by opilepsy are probably spileptic from the beginning.

An innumerable number of other causes have been suggested, such as automoracion from the intestinal tract, worms, adenoid vegetations of the pharyax, phimosis, masturbation, site. That possens absorbed from the intestinal tract can cause convulsions is probably true, but that epilepsy results in this way is very much to be doubted. The influence of the other factors suggested awaits any definite proof.

Pathology.-If one includes in the pathology of epilopsy the symp-

tomatic cases the changes in the brain are striking and of the greatest variety. These, however, do not concern us here. There has been much switten and many careful observations made upon the changes in the so-called idiopathic cases. While it is perhaps true that, with improved technic and new methods, more definite and conclusive alterations in the brain will be found, it must be admitted that at the present time in the openion of very competent authorities certain alterations can be demonstrated in the majority of instances. These are chiefly lesions in the cortex that can only be observed microscopically. A generalized gliessa has been described by Blauler, Altheimer and Chaslin. Meynert has observed a selectors in the cornu aminous and Beellich and others have demonstrated carious degenerative changes in the gauglion cells as well.

It seems probable that a great variety of lesions, many of which are

apparently slight, may people; this disease.

Symptoms.—Two distinct types of equiliptic seizures are met with: the major attacks, or groud mat, in which there are severe convulsions fasting from two to ten minutes, with loss of consciousness, etc.; and minor attacks, or petit soal, in which the convulsive morements are slight and may be absent, and in which the loss of consciousness is aften but momentary. Between these two extremes all gradations are seen.

Good Mal .- The erect may be sudden, without premonition, or it may be preceded by certain prodramal symptoms known as the sura-The sura may be motor, such as a local spasm of the hand, face, or leg! or sensory, such as numbness and tingling in any part of the body, or some abusemal sensation rising gradually to the head, at which time loss of consciousness occurs. The variety of sensations described by patients as indicating an attack is endless. There may be a sensation in one finger, in the face, tongue, eye, or in any part of the body; or the warning may be of a general character, like a trense or a shirering consistion, or a feeling of faintness. There has also been described a viscosal or pacumogastrie may, in which there is epigustrie pain, sometimes names, and a sensation of a ball in the throat; or there may be pulpitation, or cardiac distress. There may be general giddiness or vertige, or a sensetion of folioss in the head, or feelings of strangeness, or a dreamy, dated condition; and, finally, the aura may have reference to any of the special seases, must frequently to sight. Sparks may appear before the eyes, te flashes of light to color, or strange objects may be seen; or there may be a mementary loss of hearing; or strange sounds may be heard. In most cases the aura is peculiar to the individual.

At the beginning of the seizure the face becomes pals, the pupils widely dilated, the eyes railed up in their orbits and tixed. Speedily there is loss of consciousness. Simultaneously with these symptoms, or immediately following them, there occurs a sielent tonic muscular spasm to which are due the characteristic symptoms of the early part of the seizure, viz., the fall, cry, biting of the tongue, symonis, and evacuation of the bladder or rectam. The fall is fourible, violent; in fact the patient is precipitated, usually forward, and frequently suffers injury, never sinking down as in a faint. The head is often strongly rotated to one side. The position of the hands is frequently that assumed in tetany. The cry is a hourse, imprinciples sound, not very loud, and is due to forcible expiration, owing to spasm of the muscles of respiration with the glottis partially closed. The cramosis is the result of tonic spasm of the muscles of respiration; it may be quite intense, so that the face is livid, bleated, and the features distorted. The spasm of the muscles of mathematica causes the biting of the tangue. Evacuation of the bladder and rectum may result from contraction of their walls, or from spasm of the abdominal muscles. The violence of the muscular spasm in this stage may be very great; it has caused fracture of boxes, rupture of muscles, and even dislocation of joints.

The stage of tonic spasm may be only mamoutary, the patient passing almost at once into the stage of clonic convalsions. The usual deration is from ten esconds to half a minute. In the stage of clonic spasm which follows, the symptoms are those of an ordinary attack of convalsions. The museular contractions are violent, and there is often frothing at the mouth. Gradually the newells of respiration relax, air. enters the Imps, and the ryanosis purses off. After the closic spasse has continued for a variable time-from two to three minutes to half an hour-the muscular contractions become less and less frequent, and finally cease altogether. In a few minutes the patient may regain remeriorances, look vacantly around, and in a dated way perhaps ask what has happened, he being completely ablivious to all that has occurred, More frequently, however, he passes at once into a deep sleep, which centimues for an hour or muse, but from which he can be aroused. From this he taxally wakens with a savery headarbe, which may continue for seroral hours. After this he often feels better than for several days preceding the attack. During the seizure the temperature may be elevated one or two degrees, but rarely more. The attack may be followed by a slight temporary parests, uphasia, hysterical phenomena, veniting, and intense hanger. In very rare cases the arms may contain a trace of sugar.

Petit Mel.—The monor attacks of epilepsy may present a very great variety of symptoms, and at times it is almost impossible to decide that these are epileptic, except from their periodical scentrence. They pass under the names of "spelle," "attacks of discinsor," "fainting turns," etc. In recent years the term "absences" has been employed to designate them. The most striking thing which stamps them as epileptic is the loss of consciousness, and this may be of short duration, sometimes only momentary, and so pass immotived; in some cases there is none. There is no fall, but there may be a slight dropping of the head, a fixed stars for a moment or two, and that is all. The muscles are often firmly fixed so that the shald stands straight and stiff. Occasionally there are use or two contractions of the arms or a violent bending forward or nodding movement. These attacks may be may not be proceded by sura. After such a mild attack the patient's mind may be somewhat confused or be may become sleepy. One of the most striking things about attacks of petit mal is the frequency of their repetition. There may be as many as thirty or forty attacks a day. Petit mal is a serious form of epilepsy and after a time is usually associated with grand mal.

"Equivalents" are attacks in which only an abnormal mental state is manifested. They may come on after an attack of grand real or petit real or they may occur with no previous attack, apparently taking the place of one of them. Sometimes they are the first evidence of epilepsy. There may be for a time a complete alteration in the disposition of the child. He may have uncontrollable fits of anger, be disobedient or destructive, run away, and, in rare instances, even acts of violence have been committed. Upon recovery from such a state, which is usually endder, there is generally no recollection of what has occurred.

The Mental Condition of Epilepties.—A careful distinction should be made between cases in which epilepsy is secondary to some organic brain disease, and the mental disturbances seen in cases of idiopathic epilepsy. The children who are the subjects of the latter disease, and who are perfectly normal mentally, are certainly few. All degrees of disturbance may be seen, from those who are simply dull, apathetic, backward in development, and uncontrollable in temper, to those who are uslambelic, idiotic, and even maniscal. The earlier in childhood epilepsy develops, the greater is usually the mental disturbance soon, because of the effect upon the brain during its period of active growth. Mental deterioration with repeated attacks of petit and may be rapid.

Symplementic Epilepoy.—This occurs most frequently in children as a sequel of cerebral pulsy, usually with hemiplegus, and it may follow either the congenital or acquired form. Epilepoy may come on at any time after the onset of the paralysis,—from a few months to five or six years. At first the attacks may be separated by long internals, but they gradually become more frequent as time passes. The convolutions in posthemiplegic epilepoy begin, as a rule, on the paralysed side, and for a long time they may be confined to that side; but later they may become general, in which case they are indistinguishable from attacks of idiopathic epilepoy. Severe seizures are more likely to be seen than are the mild ones. Children with microcephalms often regularly suffer

from repeated convulsions that differ in no way from epileptic screams.

Jacksonian epilepsy consists in localized spasses of groups of muscles in the face, arm or leg with retention of consciousness. The most frequent lesion producing this form of epilepsy is a cerebral tumor, but almost any abnormal process involving the cortex may be the cortex. Jacksonian epilepsy is described under the diseases in which it may be found.

Course of the Disease,—In most cases seizures at first occur at long intervals, of perhaps a year, but later they become more and more frequent. Either the mild or the severe attacks may be first seen, and may remain throughout as the only type present, or they may be associated in the same case. There are most frequently seen occasional major attacks with a large number of minor ones. The interval between the optleptic seizures in most cases is from two to four weeks, although they may be of daily occurrence. Sometimes three or four sciences will follow one another closely, and then there will occur a long interval. The sciences may come on either during sleep or in the waking boars, and in some cases for a long time they may occur only in sleep. Such cases present peculiar difficulties in diagnosis, and are often long surrecognized as epileptic. The general health of patients may be quite normal.

Death rarely, if ever, results from epilepsy, except from some accident at the time of the seicures, or from the condition known as status epileptiess; in this the attacks come on with great frequency and severity, the patient at times passing rapidly from one convulsion into another, the temperature rising to 105° or 105° F_o and death occurring either from exhaustion or in come.

Diagnosis.—In most cases there is little difficulty in recognizing the major attacks when they occur by day. Necturnal attacks may be diagnosticated by the cry, the biting of the tongue, blood upon the pillow, sub-conjunctival extravasation, evacuation of the blabbler or rectum, and the severe headache. Minor attacks present the greatest difficulties, and a positive diagnosis is often impossible until the patient has been watched for a long time. The most important points to be noted are sudden pailor, dilutation of the pupils, temperary loss of consciousness, or simply mental confusion, and sometimes the evacuation of the blabbler. Psychic equivalents can only be suspected unless there is a history of attacks of grand or petit mal.

It is not always possible to distinguish between secondary or symptomatic epilepsy and the ideopathic or hereditary form, particularly if the ease comes under observation late in the course of the disease. The points which go to establish the first form are: that the convulsive movements are partial, or limited to one side; that when they are general, they always begin in the same part of the budy; or that there is a history

of partial or unilateral attacks for some time before the occurrence of any general conculsions. It is important in all cases to examine the patient carefully for signs of an old hemiplegia, the symptoms of which may be so slight as to be readily overlooked. A marked increase in the reflexes of one side is quite as conclusive evalence as is a distinct weakness of the arm or log. In idiopathic epilepsy some of the stigmata of degeneration are usually present. The sudden development of epileptiform scirares in a child previously healthy, and in whom there is no hereditary history of the disease, should always arouse the suspicion of some organic brain disease, especially tumor.

Prognosis.—The danger to hife in spilepsy is very slight. Death is generally due to some accident, particularly drewning, at the time of a seizure. The tendency to spontaneous costation of the attacks is small, while the tendency to recurrence is very great. It should be recognized, however, that matraces are not infrequently met with in which apparently clear cases of epilepsy recover. This may happen without any treatment. This is more common when the attacks have been of the grand mal type but even petit mal may come spontaneously. The attacks may gradually become less and less frequent or may come audienly without recurrence.

The prognosis in any given case depends upon the cause of the discase and the duration of the symptoms. When the cause can be removed, which is infrequently the case, and when the symptoms have lasted loss than a year, the prospects of permanent cure are fairly good. If an hereditary tendency to the discuse is marked, if the epileptic sciences have developed apart from any adequate exciting cause, and if they have continued untreated or in spote of treatment for two or three years, the symptoms may perhaps be relieved, but there is little prospect of permanent cure. In the cases also which are due to local irritation, like that resulting from an old meningeal homorrhage, the prognose is invariably lad, and only temporary relief is to be expected. A few cases of transmatic epilepsy have been cared and many have been greatly improved by a surgical operation.

Treatment.—The general hygienic and diseletic measures are of equal importance with the use of drags. The most common mistake is to rely only upon drugs, ignoring the other measures rauntioned. It not infrequently happens that drugs are without any effect when they are the only means of treatment employed, whereas in conjunction with other measures marked improvement is seen. The general hygiene of the patient must receive careful attention. He should lead a simple, regular life, as much as possible out of doors, away from all sources of excitoment. Particular attention should be given to the digestive organs. Meat should be allowed once a day and in moderate quantity. Milk should be given, also buttermilk or kumyss. Green tegetables, peas and beams, muy be given freely; also all fresh fracts. Tea, coffee, and alcohol in every form must be absolutely probabited. Under no circumstances absolut a condition of obramic constitution be neglected.

Evidences of syphilis, in the history, by physical enumeration and by the Wassermann reaction should be carefully sought. If these are present or if there is only a suspirion that syphilis may be the cause a

thorough trial of antisyphilitic treatment should be made.

The brounds are unquestionably the last means of combating the epileptic hibit. Either the softum salt alose or a combination of the sodium and ammonium bromid is to be preferred. The purpose should be to give the smallest doses which will control the sciences. Children require peoportionately larger doses than adults, and in most cases a child of five years will need from twenty-five to fifty grains a day. The method of edministering the bromids is of some importance. The larger part of the quantity for twenty-four hours should be given shortly before the time when the seizures have usually occurred; in the interval much smaller doses. In most cases it is desirable to give a full dose at Seltime. Bromids should always be given largely dillated-in from three to four ounces of water. It is believed by many that more satisfactory results are obtained with the bromids and a smaller quantity required if the sodium-chlorid in the diet is restricted to a minimum. A combination of spinm with the bromide is warmly recommended by some authors. The epium must be given in full doses and preferably for some days or weeks before giving the bromid,

Cases of petit mal are especially difficult to control. For such there is often an advantage in comboning belladonna with the bromids. In all cases the treatment must be continued for a long time if mything is accomplished. The bromids should be gradually reduced after the attacks are controlled, but must be given in moderately large doors for at least two years after the seizures have crased. Sometimes the combination of chloral or antipyrin with bromids is advantageous, particularly if the latter are hadly beene or cause an annoying amount of some. Cases have been reported of very striking benefit following the use of calcium lactate. It is descring of trial and should be given in full doors, at heat thirty grains a day for a considerable period.

The surgical treatment of epilepsy has of late attracted much altention. An operation is to be considered in cases in which the parexysms are very frequent and severe, when they are limited entirely or chiefly to one side of the body and when there is present a definite local cause, such as an old fracture of the skull, or when spilepsy has followed an injury to the head even without fracture. The results of operation are, in many instances, disappointing. There may be a diminution of the attacks for a time, but they usually recur. There are sufficient instances on record, however, of permanent improvement or even definite cure to warrant operative procedure for very frequently repeated spileptic attacks, especially if there are any evidences of localization of the lesion. Sinha epilepticus requires prompt and active treatment. A high elemeting enema should be given followed by chloral and bround by rectain in full doses. Morphin hypodermically, or versual in full doses, trional or anytens hydrate by month may be given in addition.

The education of epsteptic children is a subject of great difficulty and is often neglected. There are many reasons why it is impracticable to send them to embrary schools, and it is therefore very desirable that

special schools and rolonies for them should be established.

The Management of the Attack—Abortive measures are senectimes successful in cases with a distinct area, the most reliable being the ininlation of nitrite of angi. While the science hots, the patient should be prevented from injuring himself. The clothing should be loosened, a spool or cork should be placed between his teeth to protect the tengue, but no effort mode to restrain his movements unless he is likely to do violence to himself. An epileptic child should never be without some companion.

CHOREA

(Spirit Vitus's Dance)

* Chorw is a functional nervous disease characterized by sindess, irregular movements of any or all the voluntary muscles. Characterments are of a somewhat spacementic character, often accompanied by an apparent or real loss of power in the groups of muscles affected, and

by a mental condition of extreme irritability.

Etiology.—Chores is most frequently even between the ages of seven and fourteen years. Of 146 cases, 6 were under five years, 72 between five and nine years, and 68 between ten and fourteen years. The youngest case of which we have records was that of a skild four years sld. It is extremely rare before the third year, although it may occur even in infancy. Our own observations coincide with those of nearly all writers, that the disease is more than twice as frequent in females as in makes. While chares may be seen at all seasons, it is much more frequent in the spring months. Of 717 attacks studied by Lewis (Philadelphia), the largest number legan in March, and the next largest number in May; in our own cases May stands first.

The relation of chorea to rheumatism is of much importance. The investigations of different writers have given results which are somewhat contradictory. Some have found evidences of rhomastions in but a small proportion of the cases-in not more than five or ten per cent-while the statistics of others have placed the percentage with rheumatism as high as fifty or even sixty per cent. The question hinges largely upon what is to be admitted as evidence of rheamstism in a child; if cases of acute articular influentation only, then the number will be very small; if subscribe cases with joint arcellings are included, the proportion will be considerably larger; while if we admit cases of acute enforability without articular symptoms, and those of articular pains and joint stiffness but without swelling, the proportion will be very much increased. Our own belief is that there is a very close connection between chorea and the rhoumstic diathesis as munifested by all the symptoms above noted, and accompanied by a family history of rheumation. There seems to be a large group of cases, therefore, which may be classed distractly as rheamutic. There are, however, a few others in which no such element can be found.

Crandall has analyzed 156 cases of charsa treated in an out-patient clinic and in private practice, with the following results: Of 111 cases in which the question of rheumatism was investigated there was a definite history of it in 63. In 41, articular symptoms occurred before the choren; in 13, the first evidence of rheumatism was coincident with the chora; and in 9 it first occurred subsequent to the chores, usually within three months. In about one-third of the cases, attacks of rheumstism occurred. during or subsequent to the chores as well as before it. It may then be stated that previous rheamatism was evident in 37 per cent, concurrent rheumatism in 34 per cent, and subsequent rheumatism in 13 per cent of the eases. Excluding eases mentioned twice, and also all those in which there was a history only of "growing pains," there was ovidence of articular rheumations in 56.7 per cent of the cases. Many of these patients were under observation for several years, and it was interesting to see, as time passed, how the crideness of rheumatism multiplied the longer the cases were followed.

In the above statistics only articular symptoms have been accepted an evidence of rhemmatism. If the cases of endocardatis without articular symptoms were included, as they might fairly be, it would raise the proportion of rhemmatic cases still legher. The great proportion of constant cardine mermors persisting aftergehores, if not all of them, should be classed as rhemmatic, even if no articular symptoms have been present.

Overpressure in school is often an important element in the production of chores. Ascenia, if not an essential factor, is certainly a very important one, and the great proportion of cases present very distinct evidences of it. Choren may develop as a sequel of any of the infectious discuss, more particularly scalled and typhoid fevers. Among the reflex causes that have been suggested, but whose influence is doubtful, may be mentioned phinosis, either lumbripoids or powerms, delayed menetration, and ocular defects. The latter frequently cause a local spasm of the muscles of the eyes, which can hardly be considered chorac. Hereitary influence is of considerable importance in the production of chorac. It is much more frequent in children of neurotic families, and very often neveral successive penerations, or several shildren in the same famity, may suffer from the disease.

The exciting cause of chorea in a certain proportion of cases is fright; occasionally it arises from initiation, and the disease has been known to occur epidemically in institutions.

The role of bacteria in the production of rheimatic chora is still insettled. The organism which Poynton and Pains have described as the cause of acute articular rheimatism has been found in the meninges of the brain in a few fatal cases of chorea, but in three of our awa it was impossible to obtain any growth from the brain or other organs.

Pathology.—The exact pathology of chores is at the present time not settled. The wast of the moried process is undoubtedly the central nervous system, probably the motor areas of the cortex. The cases associated with alcomotions are now generally regarded as of infectious origin. In some severe cases which were fatal, owing to association with acute embourchitis, capallary emboli have been found in the brain. However, it is by no means established that this is the condition present in most of the electronic cases. The fact that in the great majority of such cases complete recovery occurs in the course of a few weeks or months, speaks strongly against any important structural change in the nervous centers.

Symptoms.—An attack of choren generally comes on gradually. At first the child may be considered simply as unusually nervous; if at school, there may be noticed a difficulty in writing, drawing, or in using the lunds for other delicate operations. At home, the child is continually dropping things, has difficulty in feeding himself, nunctimes in buttoning his clothes, and very frequently he is not brought to the physician until the symptoms have lasted a week or two. Sensitives the legs are first affected, and a history is given of frequent falls, a stantling gait, difficulty in going upstairs, etc. At other times the spasm is first seen in the facial muscles, with disturbance of articulation, twitchings of the eye muscles, and the child may be punished for making grimson. In most cases the spasmodic movements soon extend to all parts of the body. They remain limited to one side of the body (hemichorea) in about one third of the cases. When fully developed, the movements of chores are quite unmistakable. They are irregular, jerking, spasmodic, never

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rhythmical, rarely symmetrical, and vary in intensity from an occasional muscular contraction to almost constant motion. The movements are not under the control of the patient's will, and are usually intensified by efforts to represe them. They are increased by excitement, embarrassment, or fatigue, but do not continue during sleep.

Very often there is weakness of the affected minutes, which may be so great as to lead to the comprise that actual paralysis exists. Not infrequently we have had patients brought to the clinic for supposed paralysis, either of one extremity or of one side of the body, where the chorcic movements have not been severe enough to attract the attention of the mether. This paralysis usually disappears in the course of a few wreks.

In severe forms of choren the patient may be smalls to walk, to speak intelligibly or even to set up in best. The movements may be so violent that it is necessary to pad the bed and to wrap the child's extremities in cotton. Control of the bladder or testum may also be best. The symptoms may be so intense as even to threaten life. Such cases, however, are usually dangerous, not from the choreic movements, but from the neute endocarditis with which they are frequently associated. We have seen fatal cases, however, in which the outcome was not determined by the endocarditis. The temperature usually roses to 104° F, or more and remains constantly high. The choreiform movements are almost impossible to control even with sedatives in enormous doses, and death takes place after several days, apparently as the result of exhaustion.

The mental condition of chorse patients is one of marked criticality. They are fretful, emotional, easily provided to turn or laughter, and difficult to control. In extreme cases a mental disturbance burdering upon neute mania has been observed. In other cases the facial expression and manner of speech strongly suggest beginning imbediity. All degrees of speech disturbances are seen from the slight difficulty in articulation due to inability properly to multiply the accounts of the torque and tips, to a condition in which speech is almost impossible. In severe cases speech may be temporarily lost.

Cardiac mormors are frequent in chorca. Some of those are of anemic origin, but a large number, probably the majority, are due to concurrent endocarditis, as it shown by the fact that they are permanent, and are followed by all the signs of organic heart disease. During every attack the heart should be chooly marched, especially in children in whom there is a strong predisposition to rheumatiens.

The general condition of choosic patients is usually much below normal. They are assumic; the appetite is poor, often capticious; they alway very builty; they suffer frequently from boulaches; they are easily fatiqued by elight muscular exertion; and in short they have all the symptons of a greatly disturbed nutrition.

Course and Duration.—The ordinary form of choren tends to sporttimeous recovery in from six to ten weeks. Exceptionally it may last for three or four mentls. In a small number of cases the disease may continue for a much larger period with remissions and exacerbations. Certain forms of local spasm, particularly checoiform movements of the muscles of the face, eyes, or neck, may be permanent. In any case of choren which lasts longer than the usual time, the patient should be carefully examined for some cause of perspheral irritation. The tendency to relapses and second attacks is very marked. Later attacks are likely to occur in the spring succeeding the first illness, and in a small number of patients attacks may come every year for four or five years.

Diagnosis.—There is little difficulty in recognizing chorea from the sudden, irregular, spasmodic contraction of the muscles coming on under other circumstances. No other movements of childhood are likely to be confounded with it. The form of chorea following hemiplegia is usually more athetoid than choreic, yet at times it closely simulates ordinary chorea. The difficulty in distinguishing between the two is often inreased by the fact that the weakness of simple chorea may, if unilateral, closely simulate hemiplegia. The existence of rigidity, contractions, and increased reflexes belongs exclusively to bemiplegic cases, and these will normally suffice to clear up all dends with reference to the diagnosis.

Prognesis.—As a rule, this is favorable, and complete recovery can usually be predicted, the exceptions being few in number. Parents should always be warned of the tendency of the disease to return in succeeding years, and the fact should be stated that in a certain proportion of cases the disease may be of exceptional duration. The prognosis of the cardiac marmons occurring in charca should always be guarded, although some of those are functional and disappear with recovery from the chores; but the number of those which do not disappear is very large and sufficient to make one always apprehensive as to the ultimate result. Acute chores may be fatal from the accompanying endocarditis and much more marely from the severity of the disease itself.

Treatment.—The general management of the case is equally important with the administration of drugs. A child with chorea should at once be taken from school, and should never be subjected to punishment or to ridicule on account of the movements. Special attention should be given to the patient's dist and general nutrition. Tenics, especially iron, are indicated in most cases. The food should be simple and nutritious, and all stimulants, particularly ten and coffee, should be absolutely prohibited. While fresh air is desirable, overcise should be prescribed with great contion and its effect should be parefully watched. A certain

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amount of moral restraint is indispensable; thus it often happens that chorcic patients do very badly at home where they are indulged and reveive sympathy, while in a hospital, where they are under restraint and made to control themselves, they begin to improve immediately. In all severe cases the rest treatment should be employed. It is equally beneficial in the milder cases; the patient is put to bed, and complete mental and physical rest secured. This may be combined with gentle massage for fifteen or brenty animates a day. The daily use of prolonged warm baths, either alone or in conjunction with massage, is at times decidedly beneficial. In other cases the regular use of cold doncies is of value.

In estimating the value of drugs in the treatment of chorce, the natural course of the disease should be kept in mind, since those drugs which are taken after the third or fourth week are much more likely to be thought beneficial than those used in the early period of the attack. On account of the close association of chorce with rheumatism, anti-rheumatic remedies (sodium salicylate, aspirin, etc.) have very frequently been tried, respecially in cases with fever and endocarditis and when joint symptoms supervene in the course of an attack. Our experience has been that they rarely have very much effect upon the course of the disease. They may alleviate the pain of acute arithmits somewhat and in large discs may reduce the temperature, but they evert little influence upon the severity or duration of the symptoms of chores.

Arsenic was long, and still is, regarded by some as a specific for the disease. The usual method of administration is to begin with four drops of Fowler's solution three times a day for a still of eight years, and to increase the daily quantity by one drop every two or three days until eight drops are given at each dose. One should step short of this if digostion is disturbed, or there is puffiness of the face or albumin in the urine. Amenic should always be given after meab, and largely diduted. The possibility of arcanical poisoning should be remembered, although it is rare. We have known of several cases in which multiple neuritis developed after a few weeks' administration of the drug. In our hands arcenic has not been very effective against chores.

Severe cheres requires solutives. Not only do they relieve the symptoms but in many instances apparently here a distinct influence in shortening the duration of an attack. They must be given in quantities sufficient to produce an effect and the amount required is often enermous. The feemids, chloral, opens or morphic and vermal will be found the most efficusious. The beamids not infrequently must be suspended on account of cruptions. Morphin, hypodermically, is at times the most satisfactory drug. Improvement is shown by a diminution of the amount required to produce quiet but the above drugs must sometimes be continued for many weeks.

Choren has a strong tendency to recur, especially in the spring menths. Children who have had one attack should be closely watched, particularly with reference to their work in achool. They should not be crowded in their studies, they should have long vacations, and the nervous system should not be put upon any severe tension for a long time.

OTHER SPASMODIC AFFECTIONS

Habit Spann.—This term is used to describe certain spannodic mascular movements which at first are only accasionally noticed, but which may persist until they become habitual and almost entirely involuntary. The movements usually affect the muscles of the face, but they may be seen in almost any part of the body. The most frequent varieties consist of blinking or sudden fromning, raising the systroms, grinking of the teeth, or some peculiar grimace. At other times there is sudden twisting of the head, shrugging of the shoulders, or jerking of the hards. Habit spoon is not often seen in the lower extremities, but the muscles of respiration are quite frequently affected. There may be a half-nigh, a sort of sob, or a peculiar dry, pluryngeal cough.

These moments are at first infrequent; but as the habit becomes note firmly fixed the spasm recurs every few minutes, and in severe cases it may be almost continuous. The form of spasm is not always the same; one may disappear and another take its place. The condition may last for months or years, and it may even be permanent.

Habit spaces is really little more than congerated nervousness continuing in some definite form until by repetition a fixed habit is established. It is different in cause, course, prognosis, and treatment from chorea, with which, however, it is often confisueded.

The cames are those of neuroses in general. In the beginning, at least, the general health is usually below the normal. The patients are nerrous children of neurotic autosedents. There may be a history of some definite exciting cause, such as illness or overwork in school. There is frequently some local cause of which the spasm is merely a reflex.

Habit spasm is to be differentiated from choren; this is usually easy, from the limitation of the movements to one part or group of number and from the duration of the disease.

Treatment is quite unsatisfactory after the habit has become fixed, hence it is of very great importance that it should be arrested at the curliest possible agr. Punishments are of no avail, and usually aggravate the condition. Rewards are much more effectual. The child's surroundings, work and study should be carefully investigated. Any local cause which can be discovered should be removed. Especially should the general health receive attention.

Atherosis and Atheroid Movements.—Those terms, introduced by Hammond, are used to describe a chronic form of spasm usually seen in the hand, but sometimes also in the foot, and even the face. It may affect both sides, but in most cases it is unalateral. The macrocout is slow, irregular, and iscoordinate—a seet of "mobile spasm," it has been called—and there may be associated a certain amount of muscular rigidity. Such movements rarely occur in persons apparently healthy, but are usually seen as a sequel of sectional pulsies, generally hemiplogia. Becoming from the paralysis may be so nearly complete that the atheroid anotherists are boded upon as primary. In some cases the movementa are more rapid and somewhat resemble those of shores, the condition being sometimes classed as post-hemipropic charact. Atherois is not influenced by frealment.

Retary and Nodding Spasm of the Head.—These are rare forms of irregular movements usually observed in infancy. The condition was described long upo by Herock. The most frequent is the rotary spasm, which consists in a side-to-side oscillation of the bead, which may be slow or rapid, and in some cases is almost continuous. Some children have at times the modding spasm also, and in others this is the only movement seen. Nystaganus is frequently associated, and may affect one or both eyes. In a few of the reported cases convergent strabianus was present.

The causes of the escalation are extremely obscure. It is usually seen in infancy between the third and eighteenth months. It is believed by Baudnitz to be often the result of laying in poorly lighted mone, it being necessary for the infant to assume an annatural position of the head in order to see things held before him. The operagnus is regarded as analogous to that which develops in miners. While this explanation is entisfactory for some cases that are cared by being placed in well-lighted rooms, it is not applicable to all.

As a rule, the condition lasts for several months and improves, recovery almost always taking place. The prognosis in therefore faturalds.

Mystagman.—This teem is applied to rhythmical, involuntary, oscillatory movements nearly of both even. They are caused by the alternate contraction of opposing muscles. Nystagmas may be either vertical or lateral. It is most often seen in infants a few months old. In some cases the maximum is almost continuous, occurring even in sleep; in others, it is only noticed at times of special excitement.

The etsotogy of mystagamus is obscure, and it may occur in quite a satisfy of conditions—constitues refusable to the eye, at other times to

the central nervous system. On the part of the eye, nyetagams may be due to blindness from any cause, to congenital extanct, corneal oparity, disease of the choroid or retina, or to errors of refraction. It may be seen in almost any segante disease of the nervous system, both with focal and diffuse lesions, especially in chronic hydrocyphalus, insular selection, tuberendous meningitis, and in diseases in which sight is impaired. While it is of no importance as a locallising symptom, systagams often indicates something more than functional disturbance. An exception to this may perhaps be made when it follows cerebral concession. In such cases it is assembly temporary, disappearing in a few days or weeks. Under other conditions it may continue indefinitely.

The condition of the eyes should be investigated in every case of systageous; it is only when the cause is here, and can be removed, that habitual nystageous is smensible to treatment.

Historical (Singultus).—This is a spasm of the disphragm which is usually seen in young infants. In them it is in most cases due to some irritation in the stomach, but is found in perfectly healthy infants with no digestive disturbance. It is seen after eating, and may depend upon overfilling of the stomach with food, availiewing of air, ste. In other cases it has no relation to the taking of food. In cases like the above, bicoough, though sometimes amonging, is of little importance. It may be associated with indigestion, with intestinal flatulence or inflammation, with perstendits or with intestinal obstruction. With the last two conditions it is always an unfavorable symptom. In other children becough sometimes occurs as a pure neurosis.

The object of treatment is to remove the cause. In infants this is to aid in the expulsion of the gas from the stemach by manipulation or position. When it is a network symptom only, it may be arrested in older children by holding the breath, or by prolonged forced expiration, as in blowing a trumpet.

Thousen's Disease (Congenital Myetonia).—This rare disease is usually congenital. It may occur in several members of the same family, and is almost always hereditary. The characteristic symptoms are a peculiar rigidity of the nanocles which is observed when they are first torought into action after repose. This rigidity is spannodic, and smally containes but a few moments. It may recur when reluniary movements are again attempted. If, however, measurant effort is persisted in, it soon passes off. It is increased by apperhension, excitement, or cold, and by observation. The large are most frequently affected, the condition being often noticed when the patient starts to walk; any of the valuntary manelos, however, may be involved, even the tongue. It may be greater upon one side of the besty flux upon the other. The tendos referes are not increased but there is a marked and very prolonged contraction of the

muscles as a result of direct mechanical stimulation. The electrical stimulation of the nerves causes generally normal or dimensished contractions; that of the muscles directly, either with the faradic or galvanic current, causes a contraction that remains for from ten to twenty seconds. The disease may be noticed very early in life and it generally increases in severity about the time of paberty. Thereafter it remains stationary, or nearly so. It never causes death but is incurable, although the symptoms may be improved somewhat by active muscular exercise.

The muscle fibers are increased in size and the nuclei much increased in number. There are no evidences of degeneration, but in the succeplasm may be seen a large number of small, round, colorless or yellowish dots that seem to indicate artial disease of this substance. Something can be accomplished by manage and muscular exercises to diminish the tendency to massular rigidity, but nothing approaching a normal condition can be brought about.

Tecticellis-Wry-Neck,-Terticollis may be congenital or acquired. Regarding the cause of congenital torticollis there is some dispute. Such cases have often been attributed to the contraction resulting from hematoms of the sternomastood. It is our belief that this is rarely, if ever, the case. While it is possible that the deformity is constinue the consequence of injury received during delivery, the cause of most of the congenital cases goes lack to conditions existing before birth. It may be compared to club-foot, and may be due to a faulty position of the child is alero. There may be a congenital shortening of the sternomissoid muscle alone or of several muscles, or of all the tissues on one side of the week. Very rarely congenital terticollis is the result of anomalies of one or more cervical vertebrac. The most frequent cause in the acquired cases is inflammations of the neck, the result of tensillitis and pharyngitis. Such is the usual stickery of terticollis following searlet fever, meades, or diphtheria. The exciting cause of the spann is irritation of the cervical perves, usually the spinal accessory, though others also may be involved.

Torticellis is seen with cervical adentitis, acute or tuberculous, and with cellulitis of the neck. Indeed, it may be the result of anything causing irritation of the trunk or branches of the spinal accessory nerve, either in the spinal canal, the cranium, or along the course of the nerve trunk or of any of its peripheral fibers. Most of the cases that have been described as the result of rhounstian and cold are probably due to infectious accurring through the tousits and pharyns. A cause which the physician should always have in mind is cervical Port's discoue; torticellic may be the earliest, and for several weeks sometimes almost the only objective symptom of this disease. Infrequent causes of tor-

ticollis are acute information of the subcospital articulations, unlateral dislocation, subco-arthretis of the servical spine and cervical rib.

The ented tear to sente and accompanied by fever, or what is more frequent is that the terticolits gradually develops, it being several flavor ne works believe it is marked and permanent. The deformity varies some what, according as the sternomastood muscle is alone affected, or the posterior muscles also, and so to which productinates. In simple stemamastered stresses the head is reclined to the affected side and retated toward the approaches the chim is mised, and the car approaches the claticle. When other muscles are involved the deformity is medified. If the trapezion is effected there in less rotation of the head, but it is drawn to the affected side and somewhat backward, while the shoulder is raised and the spine curved. Both of these symptoms may be seen to a slight degree in almost any marked case of atemomatoid spasm. Senstines the spasm of the posterior muscles affects both sides; the head is then drawn backward and held rigidly, but without rotation. In recent cases the deformity can be partially or entirely overcome by passive force; but after a time this is impossible, owing to muscular shortening. Atrophy may take place in the affected muscle. In recent cases localized pain and tenderness are also frequently present, and sometimes they are severe. Attempts to reduce the determity may produce great pain.

Proposite.—The result in a case of terticollis depends upon the case, the severity and the duration of the deformity. Becovery in most of the acute cases is complete in the course of a few days or weeks. In others, after the subsidence of the symptoms of local inflammation there may be no tendency to a reduction of the deformity. This, if untrested, may be permanent, swing to shortening of the muscles and fuscia. The congenital cases with slight deformity are usually amenable to medianical or postural treatment if began early. There is in most of the other varieties a disposition for the deformity, if untrested, to persut, and even increase. If it has lasted assural months the probabilities of spontaneous recovery or even of improvement are small.

Treatment.—The first indication is to remove or treat the cause when our can be found. Acute cases are to be treated by rest in hed, hat applisations, counterirritation and friction, saless the pain is too seven. Cases which have lasted a month usually require some orthopolic headsupport, and those which have lasted six months or more are rapely cared willout a surgical operation. This may be cother a subcontaneous tensionary or meetings of the stememostoid, so an open incision. An all case of torticultie is a serious matter and radical measures should be resorted to early in the disease.

HYSTERIA

This is not a disease of childhood, but one which is occasionally seen in early life. All that will be attempted in this chapter is to point out the most common manifestations of hysteria when it occurs in children. After potenty it is essentially the same as in adults.

Etiology.—Hysteria is very rare before the savesth or eighth year, and most cases seen in children occur after the tenth year. As to see, there is no such predominance of females as in later life, although even in children's heap an important part in the production of this disease. It is seen in children who inherit a nervous constitution, or in whose parents nervous diseases, such as insunity, or hysteria, or neurasthenia, have been present. Of the other etiological factors the most important are a disordered nutrition, frequently with annuals or chlorosis, and overpressure in schools. Masturbation may not as an exciting came, or, indeed, anything which leads to an exalted nervous irritability and depreciation of the general health. It may follow any of the sente infectious diseases; or it may be excited by injury, fright, or instation.

Symptoms.—There is scarcely any disease in which the clinical picture presented is so varied as in hysteria. It may simulate almost any form of organic disease of the brain, longs, digestive organs, hones, or joints. The symptoms are seen in almost every conceivable combination.

Psychical symptoms frequently predominate. There may be seen periods of mental depression of longer or shorter duration, a change in disposition, an indifference to entroundings, a rapricious humor, or a nervous condition of extreme irritability with irregular paroxysus of laughter or morping without cause. There may be great excetability of temper, and fits of passion almost numined in their secrety. There may be various hallneinstions. Sleep in frequently disturbed, sometimes by attacks resembling ordinary night-terrors; sometimes summanibulism is present. There is often a disposition to deception about the most trivial matters, which may had for weeks. There is a tendency to imitate the symptoms of various discusses, which the patients may have witnessed in others or about which they have read. Sometimes the special senses are affected, giving rise to hysterical blindness or deafness, namelly of short duration.

Sensory symptoms are the most frequent manifestations of hysteria in early life. There is often general or local hyperesthesia, which may be so great as to simulate telleromation of the various internal organs. Anosthesia is much less common, although it may be seen in children as young as eight or nine. Anosthesia is very frequently associated with paralyses. In such circumstances it is apt to involve the whole of one or more extremities and in such a way as to be inexplicable by any organic lesion. Paralysis is an infrequent but striking symptom. There may be monoplegia as paraplegia, more rarely hemiplegia or paralysis of all four extremities. There may even be cleans and a certain degree of atrophy of the affected extremity from disease. The inability to stand or walk, though the legs can be moved perfectly in the recumbent position, is observed at times. Hemische is an occasional symptom, and is sometimes associated with great tenderness of the scalp. There may be accuralgias in the different parts of the body, or sharp pain, sometimes accompanied by vomating.

Joint symptoms are really a variety of sensory disturbances. They are not uncommon, and are often most paniling. All forms of seganic disease of these joints may be simulated. Joint symptoms are usually seen between the ages of ten and fourteen years, and occur in both sexus. There may be lameness referred to one of the large joints, currature of the spine, or torticellis. The symptoms are most frequently referred to the hip, and next to the kney, the ankle, or the spine. The pain is acute. It is increased by metion, and by attempts at overcoming the deformity, if any is present. There is a marked hyperesthesia of the whole linds, and sometimes of the body. The resistance and pain ranged by passive motion are often greater than in most joints, which are the seat of coganic disease. In nearly every case there is marked tenderness of the spine upon pressure, especially in the dereal region. The deformity may be very slight from spasm of the flexors only, or it may be severe, and followed by contracture, so that the thighs may be ficzed tightly against the abdomen with the beels against the buttorks. Such deformities may last for months. There may be considerable muscular atrophy, but only that which comes from disuse. A special difficulty in diagnosis arises from the circumstance that these symptoms occasionally follow an injury.

Organic disease of bones and joints may usually be excluded by attention to the following points: The mode of ounst is more along than is seen in bone disease, and the course of the disease is quite inregular. The degree of deformity is greater than is seen in home discase of the same duration. There is general hyperesthesia of the limb, acute tenderness of the spine upon presents, and undus sensitiveness to heat or cold. The deformity varies from time to time, being always more marked when examination is attempted. If the patients are closely watched, other evidences of hysteria may be seen. Under complete meathesia the contractures disappear entirely. There is no enlargement of the articular ends of the bones, no swelling of the soft parts, and no evidence of active inflammation or of suppuration. All the symptoms except the deformity are subjective. Under proper treatment there is in most cases perfect recovery, often in a surprisingly short time.

Directive symptoms are quite frequent. There may be loss of appetite, at times so extreme as to lead to great emarintism. There may be dysphagia from spaces of the cooplagus, or regurgitation of food on attempts at swallowing. There may be treathenous hierough. Vomiting is a frequent symptom. It is added sowers. A very frequent form not with is that which occurs in school children before starting for school. Throughout the rest of the day nothing is somited and the appetite may be good. Persistent diarrhes, constitution, meteorism, and incontinence of focus may be met with:

In the milder forms of hysteria there are seen many varieties of touse or clouic spasm. There may be local spasm of the eyes, face, or mouth, spasm of the muscles of the neck producing torticallis, of the muscles of respiration causing dyspner, which may be constant or parroxymal-Disturbances of speech are quite common especially in older children. There may be inability to speak above a whisper while the voice is retained in singing or after the application of the familie current to the neck. Stattering and stammering may be doe to hysteria. Very rarely no attempt at phonation can be made. A very common symptons is hysterical cough, which may be so frequent and so severe that grave. disease of the lungs is suspected; the rhest, however, is free from the physical signs of disease. In more severe cases we may have the symptems of chorea major and attacks of hystero-epilepsy. The latter are sure in children and do not differ essentially from such attacks in older patients. There are usually prodromal symptoms. The convaluive movements are exceedingly varied in type. There are painful sensations and sensitive areas, by pressure upon which hysterical symptoms may be increased or even convulsions excited. The respiration may be rapid or irregular. All variations in tonic and clonic spasms may be sen. Opistholonus is frequent. Consciousness is not fully lost, but is disturbed, and hallucinations are present. The temperature is nonreal.

Other symptoms occasionally seen in hysteria are polyuria, very frespiral urination, semetimes incontinence of urine, and disturbance of the secretion of saliva or perspiration.

The general condition of hysterical patients is usually below the normal. They are possely naurished and anomic: they skeep builty; they have capricious appetites and feedle digestion.

Diagnosis.—Hysteria is and to be overlooked because its occurrence in children is not considered as often as it should be. In most cases the diagnosis is easy if hysteria is suspected. A combination of vague disconnected symptoms is resulty present which admits of no other ex-

planation. Organic disease can be cocluded only by careful and repeated examinations. It is to be borne in mind, however, that bysteria not infrequently complicates organic or constitutional disease. Much importance is to be obtached to a family history of hysteria or of other nearoses.

Prognesis.—This is better than in adults, especially if the cases are taken in hand early, before the disease has become deeply scated. Very much depends upon low well the disections for treatment can be carried out. The prognesis is less favorable when the heriditary tendency is strongly marked. In many cases there are relapsed later in life.

Treatment.—Prophylaxis is of much importance. When an hereditary tendency to nervous diseases exists in a family, or whenever very nervous children are placed under the physician's care, every means should be taken to further musicular development, keeping the nervous system in the background. Such children should lend an outdoor life as much as possible, preferably in the country. They should keep early hours, have regular exercise, and their education should be directed with moderation and judgment, special attention being paid to regularity of work and the prevention of overpressure in schools. Theaters and exciting books should be avoided. All standards, including ten and coffer, should be absolutely furbidden. The diet should be plain and notificous. It is highly important that such children should be removed from association with an hysterical mother, when this is possible. The best results are smally obtained when the child is taken from his home surroundings and placed in some quiet retreat in charge of an intelligent nurse. Isolation is also lately essential in many cases.

In the general management of a case of hysteria, it is of the first importance that the child should be cared for by a person of firmness, who can exercise proper control. The general health should be sarefully boiled after, and attenic, from coll-liver oil, and other tunies given according to indications. Outdoor sports should be encouraged, and every means taken or interest the child in something which requires physical evercise. In cases of simulated disease, the child should be put to bed, ne books or this allowed, and no effort made toward his amusement. No remeathy should be rehibited, but the child should be treated with kindness and firmness. This meral treatment is quite as important as any other part of the thorspectics. In cases with hysterical joint symptoms neild constenerate to the spine, preferable by the Paquelin cauters. is comotings of distinct benefit. In no circumstances should mechanical force he used to aversome deformity. Many cases of hysteria improve under hydrotherapy; the cold denote, the cold park, or the shower both mer be used. This is valuable in conjunction with massage and the rest treatment.

HEADACHES

Headaches are not common in little children except in connection with disease of the brain or meninges; in older children they occur from causes similar to those seen in adult life. The most frequent headaches may be grouped in the following classes:

 Taxic Hendriches.—Such are the headaches resulting from uremia, from malaria, and those seen in many acute infectious diseases. But

the largest number are associated with disturbances of digostion.

2. Hendackes from Anemia, Moleculation, and Nerrous Exhaustion.— These are most frequently seen in girls from ten to fourteen years old. Some are intellectually bright, and have been crowded in their school work; others are dull and learn only with difficulty, and in consequence worzy over their work until their health becomes undermined. They deep hadly, lose appetite, and often become choreir. The anemia may be either the cause or the result of these symptoms.

3. Headackes of Nerrous Origin.—These may occur in children who are highly neurotic, either from their inheritance or surroundings, and in these who are the subjects of epilepsy or hysteria, and they may be symptomatic of organic disease of the brain, such as tumer or tuber-culous or syphilitic meningitis. True facial neurolgia is rare in child-bood except from carious teeth; from this cause, however, it is not in-

frequent.

- 4. Headacker due to Disease of some of the Organs of Special Sense.
 —In connection with the eyes there may be conjunctivitie, keratitie, iritis, errors of refraction, or strabosmus; connected with the nose there may be polypi, hypertrophic rhinitis, or adenoid regulations of the pharyax; connected with the care there may be editis or foreign bedies in the canal. Each one of these conditions requires special treatment.
- 5. Headaches due to Inherited Gout or Rheusstian.—These are not very frequent, but they may be severe, and may at times simulate the onset of meningitis. They are often accompanied by pains in the joints, muscles, or nerve tranks.

 Distirbances of the genital tract are rarely a cause of headaches in children, although this may be the case in girls about the time of puberty, especially when measuration is delayed or difficult.

Diagnosis.—The diagnosis of headaches includes the discovery of the cause, and this is often difficult. In an infant or a young child, organic disease of the nervous system should always be suspected as a cause of severe headaches. In older children the important things to be considered, because the most frequent, are directive disturbances, nervous

exhaustion, malnutrition, and visual disorders. An absolute diagnosis in a case of persistent healache can be made only by a careful physical examination, not omitting a study of the urine; often there must be a close observation of the patient for some time.

Treatment.—The only successful treatment is that which is directed toward a removal of the cause. Each one of the different groups above mentioned is to be managed differently, according to the principles elacwhere laid down regarding the treatment of these conditions. For the relief of the symptoms, cold to the head, a hot feet-both, and phenaestin in moderate doses are perhaps the most certain of all remedies.

DISORDERS OF SPEECH

In this chapter will be discoused only functional speech defects, these depending upon organic conditions being considered in connection with diseases of the brain. The most common varieties are stuttering, stammering, lisping, alalia, backwardness, and functional aphasis. All forms are much more frequent in boys than in girls, the proportion being more than four to one.

Stattering.-This is the most common form of speech disturbance. Articulation is distinct and the separate sounds are properly produced, but there is a difficulty in connecting the consonant with the succeeding rored; this sooms like an obstacle to be overcome. Occasional stattering is seen in very many children. It is more frequent in the third and fourth years, before speech is thoroughly mastered. At this age a is aggravated or produced by disturbances of autrition, but is monly a temporary condition, lasting for a few weeks or months. Recently a little boy of four was under our care, who became very anemic, slept poorly, and suffered from malnutrition as a result of the confinement incident to a home in the city. He soon began to sintler, and in a short time it became painfully marked. After a few weeks in the country he improved very much in his general condition, gained four or five pounds in weight, and his stuttering completely disappeared. In other cases stuttering follows some scute illness, and under such conditions also a is usually of short duration.

Most children who become habitual stutterers do not begin until they are six or seven years old, and sometimes even later. Stuttering may arise from imitation, and inheritance is an important etiological factor. It is frequently a mark of degeneration.

It is important that all such cases receive early treatment before the habit becomes firmly fixed. The prognosis is good for spanianeous recovery in nearly all the cases seen in very young children, and also in those coming on after scute illness. Other cases in which the condition has become habitual should have the tenefit of systematic training under a competent tenefier in Invuthing and recal gynmastics.

Stammering.—This term is sometimes used synonymously with studtering. Kusamaul makes the distinction between them that, in stammering, individual sounds are difficult of production, while in stattering it is syllable combinations. Stammering is often accompanied by some defect in the organs of articulation—the teeth, lips, tongue, or palate which is not present in stattering.

The treatment consists in careful training and in the correction of

whatever abnormal local conditions may exist.

Lisping.—In this there is an imperfect production of certain sounds, swing usually to a faulty position of the organs of articulation. The sounds may be so indistinct that they can not be understood. In this condition also there may be defective formation of some of the organs of articulation, although in the milder forms this is not the case. The treatment is similar to that of stanomering.

Alalia.—This consists in a total inability to articulate. It is seen in all young infants during their earliest attempts at talking. In elder eloibliren it is not a very rare condition, being usually associated with some mental defect.

Backwardness.—Backwardness is carefully to be distinguished from a late development of speech due to mental defects. At two years old children not deaf are almost invariably able to speak. Speech may be late in consequence of prolonged or very severe illness, and when it has once been acquired it may be lost from similar causes.

Punctional Aphasia,—The term has been applied to a temporary loss of speech which semestimes accurs in chores, and semestimes from severe fright or anything else which has produced a marked nervous impression. West records an instance in a girl of eight years, who was suffering from an attack of choren induced by fright. Speech first became difficult and then was lost altogether. For a month the child could say only "yes" and "no." The child improved very slowly, but at the end of nine weeks had recovered completely. Loss of speech sometimes follows the neute infectious diseases, especially typheid fever.

In all disorders of speech, the functional cases are to be distinguished from those which depend upon deafness and mental deficiency. The frequency with which these disorders are due to disturbances of general nutrition, and to local causes in the mouth and threat, should be home in mind, and these conditions should receive their appropriate treatment early, before the habit of defective speech becomes firmly established. For the latter class of unfortunates, special training at the hands of a compelent teacher should be advised, preferably in an institution.

DISORDERS OF SLEEP

Disturbed Sleep, Sleeplessness.—Disturbed or restless sleep is much more common in infancy and childhood than is true insomnia, although the courses of the two conditions may be the same.

Elisberg.—In infancy these symptoms are most frequently due to bunger or to indignation resulting from overfeeding or improper feeding. Very often distorbed sleep is the result of had habits, such as rocking during sleep or night-feeding. Sometimes it arises from the pain of colic or cettes, parely from doutition; at other times it may be simply the expression of a condition of extreme nervous irritability, the result of inheritance or of the child's surroundings. It is often named by the persustent activities of a fuser nurse or mother.

In later childhood the first thing to be suspected when sleep is much disturbed is some demograment of the digostive organs; in this will be found the explanation of fully half the cases. The most frequent type, when the symptom is of long duration, is chronic intestinal indigestion, often associated with distention, a condition in which formerly the usual diagnosis was intestinal worms. Other cases are due to obstructed respiration from adensid growths of the pharyns or calarged tossils, semetimes to nocturnal attacks of asthma. A lack of fresh air in the slooping room, excessive or insufficient bedelsthing, and cold feet, are other frequent causes. Disturbed sleep with "starting pains" is one of the carliest symptoms of hip-joint disease. In the nervous exhaustion resulting from overpressure in schools, and in malnutrition and anemia, disturbances of sleep are well-nigh constant. They are also seen in organic cardiar disease and in all pulmonary conditions accompanied by dyspace or cough. Sleep may be disturbed in consequence of had dreams which have their origin in exciting stories heard or read just before hedrims, or in too violent or exciting play. To discover the cause in almost any case it is necessary to investigate carefully the whole routine of the shild's life.

Symptoms.—The condition may be one of real incoming which may hast for weeks or months; or the sleep may be simply disturbed and restless, the child waking many times during the night, and when asleep will not be quietly, but constantly changes his position. Sometimes children wake suddenly with a scream, but immediately drop off to sleep again.

President,—The essential treatment consists in the discovery and removal of the cause of the disturbance. This will often involve a radical change in the manner of feeding, in the hygiene of the nursery, and in all the surroundings of the child. A change of nurses sometimes results in a speedy cure. In no circumstances should the physician countenames the use of drags to promote sleep in children, except in the case of severe scate disease. Soothing syrups and all nestrums for "teething" should be absolutely forbidden; also the sucking of "pacifiers." Many mothers and nurses fall into the habit of using them, because the injurious effects are not appreciated. When the cause of sleenlessness is found and removed the child will sleep, but compalsory sleep obtained under other conditions is usually productive of more harm than good. If food, diet, and all bad habits have been corrected, nervous causes should be investigated. When no cause can be discovered the treatment should consist in putting the shild upon the simplest possible diet, and in attention to such general conditions as anomia, malautrition, and neurasthenia, some of which are almost certain to be present. In many cases a warm both at bottime will be found beneficial. A quiet, darkened room, plenty of fresh air, and the stopping of both eating and drinking during the night, are essential to a cure in most cases. When the condition accompanies some acute disease, the drugs which are most useful are codein and trional. A child of two years may take gr. A of codein or two grains of trional as an initial dose, to be increased if necessary,

Night Terrors—Pavor Nocturnus.—Two classes of cases have been grouped under this head, both having this in common, that sleep is disturbed by fright.

The condition in the first group partakes of the nature of nightmare. It may be due to partial asphysia from adenoid growths of the pharynx, or to other causes mentioned under disturbed sleep, or it may be pastric or intestinal in its origin. These cases are quite frequent. Sleep may be disturbed from the outset, and the attack may be merely the culmination of such disturbance. The obild wakes in a state of fright and excitement, and often says he has had a bad dream. His mind is clear, he recognizes those about him, but it may be a long time before he is sufficiently calm to sleep again. The attack may be remembered perfectly the next day. Cases like this are to be managed in the same general way as those of disturbed sleep above mentioned.

In the second group are the only cases to which the term "night terrors" should really be applied. These are relatively rare, but the condition is a much more serious one. The symptom is generally due to some
disturbance of the central nervous system. It occurs especially in those
of nearetic antecedents, or those who have previously suffered from
infantile convulsions, and it is often the precumor of other nervous attacks—migraine, hysteria, spolepsy, and even insanity. The attack usually comes smidenly where a child has previously been deeping queetly,
and more frequently in the early part of the night than later. He is
generally found sitting apright in his ted in a bewilderment of terror,

being "afraid of the dog," or "the lear," or there is some other vision or ballocimation which has produced the fright. Often this is associated with sensething of a red color. The child does not recognize those about him, does not know where he is, and may go to sleep again without coming to full connciousness. The next day there is no recollection of what has happened. Usually no after-effects are seen, but sensetimes a large amount of pale urine is passed. The attacks may be repeated at intervals of a few months, or they may occur every few nights; but whatever the peculiar nature of the vision, it is likely to be repeated in nearly the same form. Such attacks have something in common with spiloptic sciences, and the diagnosis between them may at times be difficult. They are to be regarded seriously, not only on account of what they are in themselves, but on account of what may follow.

Treatment.—All mental and nervous strain should be must carefully avoided, and when the attacks are frequent the beamids should be given at heddings. Some person should sleep in the same room with the child, or in an adjoining one with the door open.

Excessive Sleep.—It is care that either infants or shildren sleep an annatural amount of the time naless one of two causes is present—organic brain disease, must frequently tuberculous meningitis, or the use of drugs. The latter is always to be suspected if with the sleep there is associated obstinate constipution. Opium in the form of "seething syrup" or puregoric is the drug which has usually been given.

INJURIOUS HABITS OF INFANCY AND CHILDHOOD

On account of the close connection of such habits with disturbances of the nervous system, they may be properly considered with the functional nervous diseases. Although some of these habits may not be of senious importance, yet us a group they usually receive too little attention at the hands of the physician. The list is very long, and only the most important case will be discussed.

Sucking.—This is a very common habit in infants, and during the first few months it is seen to some degree in most of them. If they are carefully watched the habit is easily stopped; otherwise it may continue indefinitely. Young infants usually suck the fingers when hongry, and this can startedy be considered abnormal, but an effort should always is made to stop it, lest the habit become fixed. Lindner duringuishes between simple sucking and sucking with combinations. In the former, the child stake some part of the haly, such as the thumb, fingers, toes, targets, laps, back of the hand or arm, or it may be some foreign substance, such as part of the clothing, the blanket, a rubber napple, or the

"pacifier." This is the most common form that is seen. In the second variety the stocking is accompanied by the rubbing of some other parts, which seems to afford a pleasurable excitement; this may be the ear, the genital organs, or any other portion of the body. Semetimes suching in accompanied by some practice which produces actual pain, such as pulling of the later or acratching the body. Habots of sucking often persist throughout infamey, and not infrequently throughout childhood; they have often been known to continue up to potenty. The longer the habit bus lasted the more difficult is it to break.

The results of sucking may be arrions. Deformities of the thumb or finger, of the lips and teeth, and even of the jurs, are sometimes produced. We knew a woman whose thumbs to nitraned ago showed a deformity resulting from the bahit of thumb-sucking while a child. In her case the babit was not broken until she was eight or nine years old. Probably the most permitions result of sucking is its tendency to develop the babit of masterbation. Habitual sucking of one hand or larger may lead to spinal curvature.

Trentment.-In the management of those cases the most important thing is to arrest the liabit early, before it becomes fixed. Too often the habit of thumb-sucking, or of sucking a rubber nipple, is encouraged by mothers, murses, and sometimes even by physicians because of the temporary quiet which is thereby produced. In no circumstances should it be resected to as a means of putting children to sleep or otherwise quieting the nervous system. With infinits, the only treatment which is at all successful is mechanical restraint. It is of no use to cover the part which is sucked with hitter solutions. The hands of young infants may be covered with mittens, or with the long electes of a night-given which is pinned to the bed, so that it is impossible for the child to get the part to the month; or, still better, cuffs or splints of pastsboard may be applied at the ellow, so as to prevent flexion of the arms. In the milder cases the habit is often discontinued spontaneously; but when it has been indulged in until a child is four or five yours old, it is broken only with the greatest difficulty. Panishments are of little avail, but rewards are often successful.

Masturbation.—This is not uncommon even in infancy. Many cases have been observed during the first year, and some as early as the seventh or nighth month. It is seen in children of all ages and in both sears; but in infants and very young children it is, in our experience, much more common in girls than in boys.

Etiology.—Local causes are present in many cases; they are usually something which produces undue irritation. The most frequent are, long or adherent prepare, phimose, balanitie, valvousginitie, exemuof the labor, threadwarms, and tight clothing. A urine which is irritating because of excessive acidity or the presence of crystals of uric acid may be a cause. Any irritation may lead the child to rub the parts in some way, and a pleasurable sensation being excited, this action is repeated until a liabit is formed. Other causes are exercises in which the legs are rubbed together, or the bedy against a pole, as in climbing. To these causes must be added, in infants at least, the habit of sucking. After infancy the habit of masturbation is nearly acquired from other children, but sometimes taught by victors nurses.

General causes are also important as predisposing factors. These are the same as underlie most of the neuroses of childhood—via, anemia, general multivativities, and a highly neurotic constitution or nervous instability, which is often an inheritance, and is always aggrarated by surroundings which tend to unnatural stimulation of the nervous system. When musturbation develops in a young child without any local cause, it may be an early sign of either mental deficiency or moral delinquency; it looked for, other stigmata of degeneration will often be found, and in many cases other vicious traits will appear later.

Symptoms.—In infants and very young children mastirlation is usually accomplished by thigh friction or by rubbing the body against a pillow, a chair, or some other object. The variety of ways is almost end-lass. Frequently the child will simply lie upon the floor with the thighs crossed and rigidly held, and sway the body backward and forward. This lasts for a few moments, is accompanied by flushing of the face and some appearance of excitement, followed by relaxation, and often by perspiration. It frequently happens with little children that these "queer tricks," as they are often regarded, have been continued for months before their true nature is suspected.

A consciousness that they are doing something wrong, early looks even young children to seek sectusion when they repeat the halet. It is especially likely to be practiced when children his long awake alone after they go to hed, or if they wake early. The habit is always made worse by any deterioration of the general health. We have known many children, who were thought to be entirely cured, to relapse unfer such conditions.

It is somewhat difficult to separate the general symptoms with which masterisation is associated, and upon which it largely depends, from those which are the direct result of the liabit. There are some children in whom the condition is chiefly or entirely dependent upon a local cases, or when it is only occasionally practiced, in whom no general symptoms are seen, or at most only an unnatural shoress and a disposition to seek seclusion. Others are precorious and excitable, with an excessive amount of nervous sensibility. There are others in whom more marked nervous symptoms are present; the most striking are absent-mindedness, loss of power of concentration, loss of interest in all amusements, and mental depression. Some girls of only seven or eight years may have fairly regular periods in which magnetation is practiced. In one of our patients such persons for a considerable time occurred monthly. During them even very little girls may loss all sense of modesty or decency. Every particle of self-control is gone. They become passimate, excitable, apparently passessed by the one uncontrollable desire to practice the habit. In the intervals such children may be quest, modest, excet-tempered, and perfectly normal. In some other subjects hymphomenia, or even insanity, may be the ultimate result. Epileper, cheese, or hysteria may dovelop, particularly where a strong predisposition to them shready exists in the family. The effect of musturbation upon the physical and mental development of the child may be serious when it is begun at an early age or is frequently practiced. But more striking is the change sometimes brought about in a child's moral nature. Even little children of eight or nine years may become centers of mond infection, which may involve a group of playmates or even a whole school.

Local symptoms of misturbation are not always present; in the male there may be redress and slight seedling of the prepare; the organs may be almormally large or simply much relaxed. The frequent occurrence of crections in young logs is always a suspicious symptom. In the female there is sometimes seen an almormal development of the genital argain for the age, with an early appearance of pulse hair. Little importance is to be attached to adhesions of the clitons. Sometimes there

is vaginitis.

Proposition to deal with. The cortlook is better in infants and young children than in those who are obler, because the latter are more difficult to watch and control; besides, in them the links has notally become more firmly fixed. In young children local causes are frequently found to be at the root of the trouble; in those who are obler general causes are more often present, and these it may be impossible to remove. In almost any case in which the halat has become firmly developed, many months and usually several yours are necessary for complete cire. The tendency to relapse is very strong. When masturbation is a symptom of degeneracy it is usually hopeless.

Treatment.—The most important thing is an early recognition of the condition. The physician should put parents and narses on their guard, and the first empirious should be reported and the child carefully watched until all doubt is removed. In young infants much may be accomplished by medianical restraint. The kind of restraint which is necessary will depend upon the manner of masturbating. If by the hands, they should be tied during sleep, so that the child can met reach

the genitals; if by the thigh-friction, the thighs should be separated by tring one to either side of the crib. In invoterate cases, a double sidearding, such as is used in fracture of the femon, may be applied. In children that are ever three years old, all such contrivances are almost invariably unsuccessful. It is of the atmost importance in every case to have the child under the close surreillance of a competent and trustworthy person. He should be especially watched just after being put to bed and immediately after waking. Corporal punishment is often useful in very young children, but of little or no benefit in those who are over three years old. In fact, in such cases it may do positive burm, for deception and fring are soon added to the previous vice. The mother should secure the child's confidence, and in every way possible seek to strengthen his will and stimulate his self-centrol, using her influence to help him break the habit. In fact, in older children this psychic treatment is much more important than all other measures. Often absence from home under the care of a trustworthy companion is essential to sucresuful treatment. Local causes, too, must be sought and removed whenever found. Circumcision should be done if phimoris exists; and even when it does not, the moral effect of the operation is sometimes of very great benefit. In girls improvement sometimes follows a separation under anesthesia of the preputial hood from the cliffers. But unless this is frequently repeated, the adhesions soon recur. Complete circumcision is senetimes done with advantage, and in terr obstinate cases the clitoris may be conterized. Blistering the imide of the thighs, the valva, or the propose is sometimes useful. But as a rule none of these measures accomplishes anything permanent. Care should be taken that the clothing does not irritate the parts. The child should be removed from all vicious companions; but it is quite as important that the greatest rigilance should be exercised in the home and at school, so that the child should have no apportunity to teach other children the habit. In the most serious cases the child should be sent near from home and kept from other children. The cooperation of a trustworthy marse or companion is indispensable,

General treatment should be directed to the child's condition; it is required in most of the cases. A child suffering from malnutrition and anomia should be sent to the country, kept out of doors and away from books, studies, and from everything which stimulates or excites the nervous system. Almost all active excretes except horseback may be recommended. Every means should be employed to build up the general health. These cases are most difficult and most discouraging ones for the physician. A cure results only by using all these measures and for a long time.

Nail-biting and tongue-sucking are two forms of habit which are less

frequent and less important than those already mentioned. The former is less remedied by wearing glorus and by keeping the nails cut very short. Tongue-sucking schlam becomes a fixed habit, and the child ner-ally censes it of his own accord us he grows older.

Pita or perverted appetite is an incodinate desire to cut various substances, such as dirt, until, mortar, coal, or hair. It is most frequently seen to infants but may occur in older children. This habet is met with in those who are mentally defective, but not unrely in other children. These patients are socially highly neurotic and exhibit some of the other habits common to this class. In some children gastric derangements seem to play the part of an excitag cause. Pica is a common symptom of infection with book-worm. The linkst may continue for years unless corrected. The general health often becomes seriously undermined as a consequence of the distanted digestion resulting from the presence of abnormal substances in the stomach. Children in whom such a habit is present should in the first plane be watched and prevented from indulging in their abnormal craving. Secondly, the digestion and general health should be improved according to indications afforded by the individual case.

Head-banging is an expression of extreme nervous irritability most frequently seen in infants or in very young children. It is not indicative of any special form of acryons derangement, but is caused by the name morbid impulse which leads other nervous children to scratch their faces, pull their hair, etc. While in some children head-banging secure only occasionally, we have seen patients in whom it existed for a long time. It may be repeated almost every night, and continue at intervals be two or three hours, and that without temper or excitement, but with such force as to produce remissions of the scalp and acceptate publing the sides of the crib. It is rarely a symptom of organic brain disease. Rickets is often associated and the nutrition of most of the patients is much below the normal. The treatment is general.

CHAPTER III

DISEASES OF THE BRAIN AND MENINGES

MALPORMATIONS

Tirk malformations of the brain are of great variety, and many or them are solely of automical interest, as the conditions are incompatible with life. Only the most frequent and the best-known types will be mentioned, and these which are of interest from a clinical point of view. Meningocele, Encephalocele, and Hydrencephalocele.—These three conditions have in common a protrusion of some part of the cranial contents through an opening in the skull. In Meningocele (Figs. 87, 90) there is protrusion of the membranes alone. These form a sac, which



For. 87 -- MINISPOSITIE.

Par. 88.-Recognitioners.

Fra. 89.—HTTBLECOM

is usually, but not invariably, distersed by fluid. In encephalocele (Fig. 88) there is a protrusion of a psetion of the brain substance; this is connected with the rest of the brain by a constricted neck or policie. The tumor may or may not contain fluid. In hydroxephalocele (Fig. 89) there is a protrusion of a portion of the brain substance which



Fig. 90.—Memocorne. Infant one Month old.

contains within it a cavity filled with third, this mostly communicating with the distanced lateral rentricles.

In all these conditions there is a tumor, usually pedimendated, of a round or pyriloria shape, with a smooth or lobulated surface. The ordinary size is that of a mandarin orange; it may be in small as a walrint, or as large as the patient's head. It is generally covered by the scalp, which is often denialed of hair; but it may be covered only by granulation-tissue, or it may show a central cicutrix, like that of spins beids. Other deformities, such as

spins biffds, club-fool, and haze-lip are frequently present.

All these conditions are rare, but the most frequent and most serious one is hydrocephalocele, this being usually associated with hydrocephalus. The next in frequency is complialocele, which has the best prognosis. This is frequently termed kernin cerebri. If fluid is present, it is external to the brain. In meningocele there is simply an accumulation of floid, which communicates by a small opening with the general anathroid cavity of the brass.

Of 105 cases collected by Schutz, 19 recupied the occipital region and 16 were frontal. The operators through which the occipital profracion takes place is usually in the median line. It may communicate

with the posterior footned, with the former may num, or with the cleft of a spina telida. The occupital hone may be divided in the medicar line, or rarely it may be absent.

In the manifrontal form (Fig. 92) the tumor is usually at the root of the case, a little to one side of the median line. The operture is most frequently between the cribriform plate of the ethnoid and the frontal lume. It may be between the lateral naives of the frontal lone, emising a median tumor. The point of protrusion may also be the lateral region of the skull, generally about the lateral fontanel, or along the line of the entures; it may project into the



Pro. 91.—FROSTAR MUNISCOCERS. Infant Three Months 1964

month of the pharynx. These anterior tomors are usually small, although large once containing the autorior lobes of the brain have been seen.

The theory of the origin of these malformations which is most widely accepted is that they are primarily cases of intra-ateriac hydrocephalus, and as the cranial cavity is gradually closed by the development of the bones, a certain portion of the brain is loft outside.



Pic. 92.—Nasotuovest, Mespysionest, Indaed, one week old.

Symptons.—The tensor is always congenital, although after birth it frequently increases very much in suc. A typical tensor is round and clastic, nearly giving evidence of fluid; it usually palastes synchronously with the heart; during screaming or forced inspiration, it increases in size; partial and in some cases complete reduction is possible, but this is usually followed by marked condend symptoms, even by convulsions. After partial reduction, an opening in the skull may often be made out. Micro-

cophains may be present, or there may be unequal development of the two sides of the lacal.

The following deferential points indicate the most characteristic features of the three expectes: In maningoods, the tumor is at first small, but increases; it has a smooth surface; it is polanculated; there is distinct fluctuation, perfect transferency, rarely pulsation; often it is completely reducible; compression of the tumor causes cerebral symmetry.

toms; the skull is normal. In encephalocele, the tumor is small and smooth; it is rurely pedanculated; fluctuation is absent; it is not translucent; there is distinct palsation; it is usually reducible; pressure causes cerebral symptoms; the skull is normal. In hydronorphalocele, there is a large pendulous tumor with an integular or fobulated surface; it is polanculated; translucency is rarely complete; fluctuation is distinct; it is irreducible; pressure rarely causes symptoms; microcephalus and other deformities are often associated.

The excipital tumors are usually more serious than the frental ones. The majority of cases do in the course of the first few weeks of life, death resulting from meaningitis, convulsions, or repture. In meningocals the tumor usually grows slewly, and ultimately may be shut off from the cranial cavity; but gradual thinning of the membrane may take place, and spontaneous or accidental supture occur. In encephalocele the tumor grows slightly, or not at all. Most of these patients exhibit signs of mental impairment or other evidences of arganic brain disease.

Treatment.-According to Treves, operation is justifiable only in ease of impending rupture. The conditions present are essentially the same as in spina bilda. Meningoccle may be aspirated or the sac may be taid open and a plastic operation performed for the closure of the communication with the cranial carrity; or the skin may be divided, and a limiture or clamp applied to slott off the communication with the brain. All these methods have been at times successful, but recovery in many instances is followed by the development of hydrocephalus. Encephalocele is to be treated by protection and compression. Aspiration may be resorted to if fluid is present. In hydronosphalocele the prognosis is absolutely bad under all circumstances. Schatz gives the following statistics, showing the results with and without operation, all tarieties being included: Of twenty-four occipital fumors not operated on, three recovered; of thirty-five operated on by excision, ligation, or injection, six recovered. Of forty-six frontal tumors, there were six recoveries in thirty-two cases without operation, and two recoveries in fourteen cases with operation.

Microcephalus.—This is often regarded as due to preciature ossification of the skull; but the hypothesis is certainly inadequate to explain most, if any, of the cases. In many children suffering from marasmus, the sutures easily and the fentanels also much earlier than in healthy infants of the same age, chiefly because, with the rest of the body, the train also has almost coased to grow. In microcephalus the early conficution of the skull is musally due to arrested growth of the brain, and not the reverse. The remons for the developmental arrest in the brain are for the most part unknown. It is well known that there is not an invariable relation between the time of the bond and the size of the brain, although generally the two correspond. If the circumference of the head is much below the average for the age (see introductory chapters), and relatively much less than the measurements of the rest of the body, microsophulus may be assumed to exist. Suchs calls attention to the fact that the circumference of the head may be nearly normal and yet the countral conditions of microcophulus exist, owing to imperfect development of the anterior part of the brain.

The symptoms of microcephalus are those of mental deficiency and cordinal paralysis, existing in all possible combinations and with variable degrees of accepts.

The essential condition in microcephalus being an arrest in the development of the brain, it is not difficult to understand why the operation of cranicatomy once thought promising has been generally shandowed. The results do not justify any operative measures yet proposed for the relief of these cases.

Congenital Hydrocephalus.—These cases may fairly be considered as belonging in this group, although they are discussed elsewhere.

Perencephalus (literally, a hole in the brain) is a condition in which there is a large depression in some part of the teain, but with surrounding parts well developed. Such depressions may involve a whole lobe, and they may be deep enough to reach the lateral restrictes.

Perencephalus is described as congenital or acquired. In the congenital form, the defect is usually found in the anterior or middle part of the brain. The origin of these conditions is still a disputed question. They are probably due to early vascular changes. Children sometimes live several years with very large defects, the symptoms depending upon the seat of the levion. The acquired form of perencephalus is usually one of the late results of meningeal homorrhage. It may affect one or both sides. Such cases present the symptoms of spastic paralysis—usually diplogia. In all cases with large brain defects, the space is filled with fluid.

PACHYMENINGITIS

Pachymeningitis, or inflammation of the dura mater, occurs both as an acute and a chronic disease.

Acute Pachymeningitis.—This is very rare in children. Only pachymeningitis externs is generally included under this term, as nexts pachymeningitis interns does not occur alone, but usually with inflammation of the pin mater (Isptemeningitis). It may be associated with disease or injury of the boxes of the skull, but is most frequently seen in con-

nection with middle-car disease. It generally begins as a localized process, but the inflammation may extend to the inner layer of the dura, and to the pia mater; or it may remain circumscribed, and terminate in the formation of an abscess between the dura mater and the bons.

The symptoms of acute packymeningitis are distinctive only when the process is localized. They are then usually associated with middleear disease, and are indistinguishable from those of cerebral abscess. The treatment is surgical.

Chronic Pachymeningitis.—This, in children, almost invariably affects the inner layer of the dura namer (puchymeningitis interna); it is also known as pseudo-membraness and as accrowdagic packymeningitis or heradown of the ours mater. Its causes are for the most part unknown. It is a rather rare condition, being usually discovered at autopsy in children, chicaly cachectic infants, who have died of other fibraters.

Two classes of cases are to be distinguished—those with, and those without extensive hemorrhages. In the latter group there is found a thin, translatent, useralar membrane lining the inner surface of the dura. It may be only a delicate film which can be scraped off; it may be as thick as ordinary Motting-paper, or even twice that thickness. The membrane is often edenatous; it is exceedingly vascular, and the resula have very thin walls. There are usually scattered punctate hemorrhages, and there may be a few of larger size. This membrane may ower the whole inner surface of the dura, but in most cases it is principally over the convenity and may be found only here; it is upt to be more upon one sale than upon the other. In cases of long standing there may be adhesious between the dura and the pia. When large hemorrhages have taken place, quite a different pathological appearance is presented. The besions found in one of our cases are fairly typical : The infant was six months old, and the symptoms had existed for six-days. The foatured was bulging to a merked flegree, and the sagitful and coronal autures were separated. A thin recent that from one-eighth to one-fourth of an each in thickness covered nearly the whole of the right hemisphere and part of the convexity of the left. The entire dura was limed both at its convertty and have by a pseudo-membrane of grayish color, about one-sixteenth of an inch in thickness. The brain was anemic,

In cases of longer standing partial organization of the clat may be seen; in more recent ones the blood is partly se entirely fluid. We once saw acute deptoneningitis with a purulent exadation, associated with bemorrhagic packymeningitis. In cases where life is prolonged for years, there may be partial or even complete absorption of the clot, followed by the formation of cysts, considerable inflammatory thickening of the pia with deposits of blood pigment, and finally atrophy and scherosis of the corriex. The source of the temperage may be the rupture of a single large vessel, but more frequently the blood comes from many small vessels.

Symptoms.-These are due to the hemorrhage, and not to the inflammatory process. Until hemorrhage occurs there are no symptoms by which the disease can be recognized. Thus in many of the cases in which pachymeningitis is found at autopsy, its existence is not suspected during life. The occurrence of homorrhage is conclined marked by comiting or convulsions, and notally there is loss of countousness. It may be a question whether the convulsions are the cause or the result of the hemorrhage. In most cases they seem to be the result. They are usually general and repeated. If the hemorrhage occurs slowly, there may be stuper without convulsions until nearly the end. In the fatal cases the symptoms generally continue from two days to a week. There are dulness, stupor, and finally come, death occurring in come or convulsions. If the hemorrhage is diffuse-and this is ant to be the case—there is rigidity of all the extremities; if it is of one able only, the rigidity affects only one arm and leg. The yaquis are more frequently contracted, but may be sillated or unequal. There is diplegia, beniplegia, or monoplegia, according to the sent and extent of the hemorrhage. The respiration is shor and irregular and may be of the Cheyne-Stokes sariety. The pulse is slow, treegular, and sometimes intermittent. The temperature is at first normal, but rises slowly until death occurs, when it is from 1000 to 1000 P. Generally the cranial nerves are not affected, and opisthotoms is absent. The knew-jerk is often exaggerated. In cases which do not prove fatal-these being chiefly in older children-we have a similar quet, but after a few days coneconeness is regained, and only hemiphyria or monophyria remains. The course of the paralysis is that even after meningeal hemorrhage the to other causes. Wagner has reported a case in which recurring hemorrhages took place at intervals of several months, the autoper showing distinct wrideness of both old and recent botons.

Pachymeningitis, we are inclined to believe, plays a more important rolls in the production of meningeal bemerrhapes in children than has generally been accorded to it. From the frequency with which this lesion is formul as a cause of sudden meningeal bemorrhages which are fatal, it is not unlikely that some of the cases which reserve with bemiplegia or monoplegia, may be due to the same cause.

The prognosis depends upon the age of the patient and the extent of the hemorrhage. Extensive bemarrhages are smally fatal in infancy, but small once are solden so, for they are rarely at the lase. The progposis of the paralysis in cases not terminating fatally is the same as after meningeal bencomings due to other causes, with perhaps an added biability to recurrent attacks.

Without large homorrhages, packyrsoningstis interna can not be diagnosticated; and it a impossible to differentiate the homorrhage cases from other varieties of meningeal homorrhage. It is important to make a diagnosis between packymeningstis with hemorrhage, and near meningstis. In the former there is a sudden onset; stupor accurring early, usually on the first day, gradually diminishing in cases of recovery, or deepening into come in fatal cases; localized or general paralysis, also occurring early; there is no ferer in the beginning, and only moderate fever at the close. In scate meningitis there is usually a higher temperature, especially early in the discuse; come develops later, and rigidity of the extremities is less pronounced. However, when the hemorrhage occurs in the course of some other disease, a differential diagnosis may be impossible without lumbar puncture.

Preselvent.—The treatment of hemorrhagic puchymeningitis is symptomatic. The indications are, to relieve cerebral congestion by applying ice to the book, to allay irritative symptoms by the use of beamids, and to keep the patient perfectly quiet.

ACUTE MENINGITES

Several different varieties of acute meningitis are met with in children. Cerebrosponal meningitis is the only form which occurs opidemically, but this is also seen as a spondic disease. It is due to a specific organism, the meningeocecus. There are several other forms of acute meningitis which more or less closely resemble cerebrospinal meningitis chincally, and which were for a long time confounded with it. Puenesses can and influenza meningitis are usually secondary inflammations, but sometimes are apparently primary. The typheed bacillas and the genecoccus may cause areate meningitis, but very rarely in children. Acute meningitis may be due to any of the progenic organisms. This is senectimes spaken of as "septic" meningitis, and is almost invariably secondary. Finally, there is tuberculous meningitis, altogether the most sommon variety in young children except during epidemics of cerebrospinal meningitis.

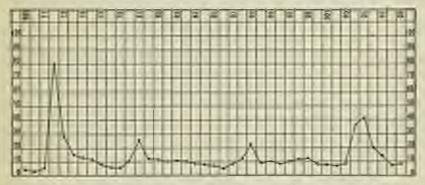
Some idea of the relative frequency of the different forms of acute maningitis as seen apart from epidemics, may be gained from the following figures which give the number of cases occurring in the Rubies' Hospital for a series of years, the diagnosis in every case being made by lumber puncture or by autopey. The patients were nearly all under three years of age. The organism found was so follows:

Tuberrie bacil	Tiet	157 cares
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CEREBROSPINAL MENINGITIS

(Epidemia Mesingitia; Cerebrospinal Pener).

Epidemics of serebrospinal maningitis are separated by quite long inferreals and occur without my assignable cause. The following chart (Fig. 23) represents the prevalence of the disease in New York City during forty years. But little was seen of cerebrospinal meningitis until the spidemic of 1822. Since that time a certain number of deaths from this source have occurred each year; but there have been seen about once



Pro. 02.—Chart smowisk Davins from Crandomortical Manysums in New York, City, ron Poury Yagan, sun 200,000 or Porthagon.

in ten years epidemics of greater or less severity. The most important one was that of 1904-5. After each epidemic, for two or three years, the disease is prevalent, but it occurs with gradually lessaning frequency until the average incidence is reached. What has been said of New York is true of almost every large city. In remote country towns, epidemics are occasionally witnessed, and after prevailing a few months the disease disappears as mysteriously as it cause. Epidemics are usually seen in the winter and early spring, lasting for several months, generally reaching their height in March or April and slowly subuiding as warm weather approaches.

With reference to the cause of epidemies very little is known. When the discuss prevails in cities it occurs especially in crowded tenements, being relatively infrequent in private bouses.

Cerebrospinal meningitie has only recently been included among the communicable—iseases. In a series of observations made by the New York Health Department the messing sources was found in the mual secretion of tifty per cent of the cases of meningitis examinal during the first two weeks of the disease. It was found in the pass) mucus in ten per cent of the persons in close contact with eases. In Flexner's experiments upon monkeys he found the organism in the moal mucus after animals had been inoculated for war of the spinal varial. These observations indicate that the nasal muccoa is a common avenue of infection and probably also a channel of elimination. The degree of communicability when compared with the common contagions diseases ssens very slight. In fully seventy per cent of the cases investigated in the New York spolemic of 1904-5, but one person in a homoladd was affected, although no effort at isolation was made. We have never known the disease to originate in a hospital patient, although in New York cases of cerebrospinal meningstis have been until recently received into the general words with other putients. Sporadic cases of moningitis occur after epidemies, and quite apart from them without apparent cause, and it is very exceptional that any connection with a pervious case can be established. About fifty per cent of the cases of oursbosspinal memogitis occur in shildren under five years, and about twelve per cent in those under one year. The youngest case we have seen was in an infant six weeks old.

The specific organism of cerebrospinal mealingitis is the diplosoccus intercellularis of Weichselboum or, as it is now generally designated, the meningococcus. It is present in the meningeal studate, in the serebrospinal fluid obtained by lumbar puncture, and in some cases can be demonstrated in the blood, the lungs and other organs, sometimes in the large joints. It is almost invariably found in pairs or tetrals within the bracocytes. It is decoborised when stained by Grana's method, Outside the body the segunism is unknown.

Lesions.—In spidemic meaninging death may take place so early that the changes found at antopy are slight. There may be only a serious explaint and intense hyperemia, which is deabtless much less marked after thath than during left. The combinational fluid is surbid and much increased in amount. The microscope, however, may show, even in these early cases, an abundant explaints of leucocytes in the pia mater. After the third day the lesions are quite uniform. The convolutions appear semi-what flattened from pressure due to distention of the rentrades. The inner surface of the dura is usually normal or only congested. There may be through in any of the cerebral sinuses, or in the maningeal reins of the convexity. There is an explaint of greenabusellow fibria, which is sometimes very abundant. It is generally widely

distributed, but is usually most marked over the anterior half of the tenin and at the base. In some cases it is limited to the base, but very randy limited to the conventy. There is an increase in the quantity of cerebrospinal fluid. The centricles are moderately distended with serum or sero-pus, and their walls may be alightly softened. The brain substance of the cortex may be reddened or may appear normal. In the meninges of the tord, lesions similar to these of the brain are usually seen. The explation is principally upon the posterior surface, and may extend throughout the entire length of the cord, or to limited to its upper or to its lower portion.

Microscopical examination shows the exadation to consist of films and pas cells, which infiltrate the pia mater. The superficial layers of the cortex in the inflamed areas often show minute hemorrhages and very marked cell-infiltration. Minute absences may be present. Very marked degenerative changes can namely be demonstrated in the nerve rells themselves. The cells of the neuroglin are also affected; they are swollen and increased in number; and there may be proliferation of the connective tissue about the blood reachs. Changes similar to those just described may be found in the cord, but these are less frequent and as a rule much less severe than those in the brain. Inflammatory products are sometimes present in the central canal of the cont and in the walls of the lateral ventricles of the leads. The inflammatory process frequently extends along the cranial nerves, especially the auditory and optic, and this may result in otitis or choroiditis; from the cord, it may extend along either the anterior or posterior perce roots. Descending degeneration is found in the nerves both of the brain and the oard.

In patients that die after the discuse has lasted two or three months, the later results of these become may be seen. There is usually present a chronic memisposeneryhalitis, sometimes disfuse, cometimes localized. The pea mater is clearly, thickened, and frequently adherent to the brain. Here and there are seen small, yellow, equippe patches which are the result of fully changes in the cells and fairin of the exidate, with some proliferation of connective tissue. The lesions are usually most marked at the base, where the thickening of the meninges and the adbesions may lead to the development of a secondary hydrocephalus,

In cases which have lasted a much longer time very marked changes are found in the brain substance. There may be generalized meningeal adhesisms, with a diffuse cortical alreaphy, but more frequently there are areas of sclerosis, especially over the frontal and temporosphenoidal lobes, with which there are almost always associated marked descending degenerative changes in the cord. Such lesions are, of course, permanent, and serrously interfere not only with the functions, but also with the growth and development of the brain. The lossons and their effects are well illustrated by one of our patients who died six months after an attack. She was a bright little girl of four and a half years, and had a typical attack of meaningitis of moderate severity. Convalencence was slow, but at the end of two months recovery was perfect in everything but her mental condition. She remembered nothing which she had previously learned in the kindergarten, where she had been an exceptionally bright pupil. Her mind was a blank. She was dull, listless, and her face had a vacant, idiotic expression. The special senses seemed unaffected, and her speech was retained. She died during an attack of convulsions. At the autopsy the pia was everywhere thickened and adherent, while in the certex were present the earlier changes of a general encephalitie.

The visceral lesions most frequently found in epidemic meningitis are pulmonary. There may be lobar or broachopseumonia, and in the longs may be found the same organism as in the brain. Acute degeneration of the liver and kidneys is also frequent. The other siscera are seldem affected. Occasionally supportative inflammation of the joints occurs.

Symptoms.—The symptoms of cerebropoinal meningitis do not differ essentially in the sparadic and epidemic cases, except that the most severe forms of the disease are seen in the latter. They may be divided into several quite distinct groups:

1. Hyper-scale Form.—Cases of this kind are rarely seen except in an epidemic, and usually scent at its height. The onset is very alongt, the course short and intense, and death may take place in from twelve to flurty-six hours. The following case illustrates this type: A little girl of ten years was well enough at 2 r.m. be carry a bundle of clothes a down city blocks. Beturning home, she complained of intense head-ache, vomited frequently, and was so weak that she was obliged to go to bed. In a few hours she passed into deep comm, with very high fever, and died at 11 r.m.

The surficest symptoms are usually intense headache, repeated attacks of vomiting, and very high fever. There is great prostration and the nervous symptoms increase so rapidly that in a few hours the patient may become comatose and death occur in a short period. The temperature rices rapidly to 103" or 104", semetimes to 106" F. A few petechial spots may be discovered over the face, chest, at extremities. There is assually no rigidity, but rather general relaxation. The pulse is weak, in most cases rapid, but sometimes slow and irregular. The respiration is usually irregular both in frequency and depth.

The symptoms appear to be due to two factors; the intensity of the infection, and the rapid accumulation of corebrospinal fluid, causing come with scentical respiratory paralysis. Usually both these factors are present, but the second one seems the more important. In support

of this view is the striking infrequency of cases of this type in infants with an open fontanel. Should the patient survive the violence of the onset, a period of reaction occurs, and after a day or two the discase follows the regular course.

2. Usual Form.—In this also the onset is generally alropt, but not so violent as in the cases just described. It may be marked by intense localizable, counting, convulsions, delirasm, chills, and fever with general hyperesthesis and rigidity. The initial temperature is from 101° to 101° V. Opisthotomis, with severe pains in the back of the neck and along the spins, and general massular rigidity are usually present. There is often active delirasm, but much staper or some. The pulse



Fig. 18 - Program by Communication Management (Smally)

is generally rapid, 120 to 150, and sometimes irregular. The respiration is often elightly irregular, and it may be rapid or slow. The cruption is not so frequently seen as in the very acute cases.

As the disease progresses, the servous symptoms often change but little from day to day for two or three weeks. They are mainly of the irritative type—moderate delirium, extreme hyperesthesia, tremor and muscular rigidity. The posture is quite characteristic (Fig. 34). Ouring to the opisthotomus the skild can not be upon the back, but restupen the eide, with arched spine and neck, and general flexion of the extremities. There is a rather rapid loss in weight, steadily increasing prostration, and a weak, rapid pulse. The lowels are usually constituted. From time to time attacks of runniting occur. In many cases there is considerable difficulty in feeding. The duration of this form of the disconsiderable marked by periods of remission and enscerbation. If recovery is

to take place, the temperature gradually falls to normal and often at times it is subnormal. The mind becomes clear, and one by one the nervous symptoms disappear, the muscular rigidity being usually the last to go. Convulencence is always protracted.

In cases ending fatally, the patient usually passes into a deep staper or come, with extreme prestration, a slow, weak, irregular pulse, shallow respiration of the Chepne-Stokes variety, sunken abdomen, general relaxation, and death occurs from exhaustion or from tevachopusumonia.

Occasionally the attack is much perlonged, the fever and all the active symptoms continuing from eight to twelve weeks. Emaciation sometimes becomes extreme, and with a few nerrous symptoms may continue long after the fever ceases. In infants, death is often due to marassons. While a fatal outcome is more frequent in these prolonged cases, a few recover completely, even when marked symptoms have lasted for eight se ten weeks.

- 3. Wild Form.—Especially toward the end of an epidemic, and sometimes occurring sponstically, there are seen cases which in their cases and for the first two of three days resemble those just described; but instead of running the usual course, the fever and the nercous symptoms subode rapidly and convolencence is established early.
- 4. Chronic Form.—Owing sometimes to the extent, nonetimes to the position of the lessons, the disease does not subside at the most time, but nervous symptoms continue after the temperature and most of the other constitutional symptoms have passed away. These cases are chiefly of the basilar type, and often lead to the development of chronic basilar meningitis with secondary hydrocophalus. They are more fully considered in a later chapter.

Once to the most straking features of this disease is the abruptness with which it develops. Occasionally there are indefinite symptoms for a day or two before active symptoms begin; but in the great
majority not only the day, but the hour of the caset is definitely marked.
The most frequent initial symptoms are the simultaneous occurrence of
severe headache and remitting, followed by high fever and marked practration. The vomiting is usually repeated, projectale, and has no relation
to meals. Convulsions occurred in the beginning of thirty per cent of
our cases. Occasionally a decided chill is seen. After twenty-four hours
scate general pains and hyperesthesia are usually present, together with
rigidity of the mincles of the neck and extremities, giving rise to opisthotoms and minerial contractions.

Stin.—Eruptions upon the skin vary much in frequency in different cases and in different epidemics. The most characteristic one is the appearance of small punctate homorrhages, resembling flee biter; they are not numerous, but may be found on almost any part of the body. most frequently upon the extremities, the upper part of the closet, and neck. In our experience they have been present in about fourteen per cent of the cases. Sometimes larger hemorrhages are present. We have twice seen a very extensive purportic eruption with hemorrhagic areas from half an inch to three inches in diameter over the face, buttocks, and extremities. This cruption belongs to the early stage of the disease and is rarely visible after the third or fourth day unless unusually extensive. In some cases a general crythema is present; in others, an cruption closely resembling measles. Herpes upon the tips and face is remined in older children, but is rare in sofants. Bed-seres are very common in protracted cases. They are found over pressure points—the trochanter, the malleoli, and the side of the head; in several instances the ear has been the part affected.

Nersons System.-- Headache is a frequent initial symptom and is usually severe; it is more often frontal than elsewhere, and may be assoeinted with vertigo. There are neute pains in the back of the neck, along the spine, and marked general hyperesthesia, which is often so intense that any movement of the body causes aguniting cries. This is one of the most striking symptoms of the disease, and may continue throughout the neute stage. The mental state varies much in different cases. Delirium is frequent in the early stage of the severe form; it is usually notice, sometimes maniacal. After delirium dulness or apathy ensues, giving place to great irritability when the patient is disturbed. Convalsions are not uncommon early, but are selfout repeated in the course of the disease or toward its close. There is rarely continuous stupes or deep come except toward the end of fatal cases. In many cases with high temperature and quite severe symptoms, after the subsidence of a short early stage of excitement or delirium, the mind remains perfectly clear throughout the attack. In these circumstances an erroneous diagnosis is often made, particularly if the physician has not observed the case from the legisning.

Tonic spasm of the various muscular groups is one of the most characteristic features of this discuse and is selfom absent. Like the hyperesthesia it is persistent. The rigidity and contraction of the muscles of the neck and back produce cervical or general opisthotomus; cervical spisthotomus is most marked with lesions chiefly at the base, and may be wanting in the rare cases when the lesion is almost entirely at the convexity. Tonic spasm of the extremities usually causes general flexion of the thighs, legs, and arms. Late in the discuse this may be replaced by complete extension of the lower extremities with dropping of the feet. The tonic muscular spasm gives rise to Kernig's sign, riz., (nabbity to extend the leg when the thigh is flexed upon the body. In young shillern one should not place too much dependence upon this sign.

Waile rarely wanting in cerebraphial maningitis, it may be present in other conditions. Brodzinski's sign is frequently present, but not diagnostic. Muscular rigidity is one of the most constant symptoms of exceloropinal maningitis and one of the last to disappear. It may be absent in the early stage of the hyper-acute cases, and very late in fatal cases, when there may be general relaxation. Other nervous symptoms frequently present are askle closus, muscular treasor, especially of the hands, and paralysis, which may be facial, monoplegic, or hemiplegic. Early in the discuss the knee-jerks are usually increased; in the later stages they may be lost.

Eye and Eur .- The pupils in the early stage are generally contracted; toward the close they are usually widely dilated. Ocular paralyses are not so frequent or so marked as in tuberculous meningitis. The same is true of the changes in the optic disc, although these vary much in different epidemics. There may be congestion of the fundas, estimitis, or optic neuritis. In some epidemics such changes have been observed in fully half the cases. In that of 1904-5, in our hospital cases, they were rurely seen, and then were but slightly marked. Conjunctivities is frequently present and may be server. There may be chamilities and sometimes complete destruction of the eye, but usually this is milateral. In most epidemies the care are more frequently affected than the eyes. Early deafness may be due to a lesson of the auditory nerve, is generally billsteral, and often permanent. Acute otitis media occurs as a complication, and the nextingocoreus is occasionally found in the discharge. Permanent deafness is sometimes due to charges in the anditory nerve or in the brain itself.

Fever.—This discose is neually attended by high fever, but the cures is apt to be an irregular one and show wide variations. The temperature is nearly always high at the onset; in the hyper-acute cases it may reach 186° E, or higher. The usual range during the discose is from 100° to 105° F. (Fig. 95). Sometimes it is steadily high; not infrequently a few days after a sharp acute cased it falls nearly or quite to normal and remains there for several days. Cases seen in this afebrile period are most difficult of diagnosis. This stage may be followed by another sharp rise, and afterward continuous fever. Periods of remainson and exacerbation in the temperature are seen in a large proportion of the prolonged cases. Often it becomes subnormal. The temperature may bear no relation to the severity of the other symptoms. Its course is greatly modified by the across treatment.

Empiration is disturbed very early in the disease, when it is often irregular and may be slow or rapid. Throughout the greater part of the attack it may be nearly normal. Occasionally it is of the typical Cherne-Stokes variety. Pulse,—Throughout the greater part of the disease the pulse is rapid. In the early stage it is often weak, and sometimes irregular. The average frequency in young children is from 130 to 150. A slow, irregular pulse is occasionally seen late in the disease in putients who are in deep coma-

Blood.—A leacocytom is present in nearly all cases. The average is from 23,000 to 40,000. This increase is chiefly in the polymorphonuclear cells which usually form from 80 to 85 per cent, of the loncocytos. Blood cultures made early in the discuss have in some cases above the presence of the characteristic organism.

Digestive System. - Vamiling is one of the most frequent symptoms of onset but rarely persists throughout the attack. Late in the disease

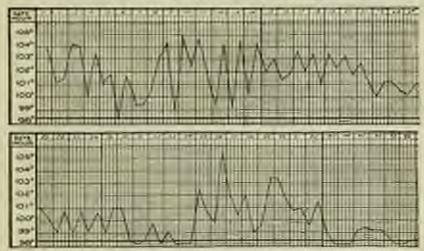


Fig. 95.—Communication: Majoratries. Recovery without series treatment: Fairly typical chart of prolonged vace, showing remissions and exacerbations. Patient 314 years old; unconscious, blind, and deal for 314 months; complete recovery.

it may be most troublesome. As a rule constipation is present. The tongue is coated, dry, glased, sometimes covered with sordes. In a small proportion of cases jaundice has been observed. On account of the loss of appetite, great irritability, debrium, and stuper, the greatest difficulty is often experienced in feeding these patients. In young children gavage is much more satisfactory than rectal feeding. Early in the disease the abdomen is natural. In the late stage it is often very much retracted.

General Nutrition.—This is impaired in nearly all cases. There is a progressive wasting, greater than would be explained by the disturbance of digestion. In the protracted cases it may be extreme. Infants and young children often die of manificu or marasmus long after the active symptoms of the disease have subsided.

Other symptoms of importance are the tense, bulging fentanel, in

infants rarely absent early in the attack, but often wanting in the late wasting stage; incontinuous of urine and feces, and retention of urine, are very frequent and often overlooked; occasionally swelling of some one of the large joints is seen.

Course, Buration, and Termination.—Excluding the hyper-acute cases in which death occurs very early, the usual duration of active symptoms in cases not treated with scrum is from three to six weeks. Of 350 cases recovering without scrum, the disease lasted less than one week in three per cent; in fifty per cent it was five weeks or longer. Some very protracted cases terminate favorably. We have seen one child recover templetely after 84 days of fever, and another after 102 days. Most of the prolonged cases are marked by periods of exacerbation and remission. Not until the temperature has been neutral for several days, the mind has become clear, and the hyperesthesia and rigidity have entirely disappeared, can we consider emitalescence as established. Becovery is slow, and it may be many months before the child in quite well. In 220 cases receiving scrum treatment the average duration of active symptoms after the first injection was 11 days.

In fatal cases, death may come early from come, convulsions, or heart failure. It may occur in the middle period from complications, most frequently possessorie, or the terminal stage of the disease may be seen with extreme wasting, and family death from exhaustion.

Complications and Sequelae.—The chief complications are puremonia, editis, conjunctivities or choroiditis, and bed-sores; rarely, asphritis and arthritis. Sequelae are, unfortunately, very common. There may be perfect recovery so far as physical functions are concerned, but the child be left mentally deficient. In some rares the defect is so slight as not to be evident for several months or even years, in others the mental faculties are entirely lost. There may also be various types of paralysis—strabismus, facial paralysis, monoplegia, hemiplegia or diplegia, and often contractures, which are senetimes temporary, but apt to be permanent. The neute attack may be followed by chronic maningities with hydrocophalus. Deafness is quite common, usually of both ears, and deaf-matism is not an infrequent result in young children. Blindness is not so common and is usually milisteral. As a late result epilopsy may develop.

Prognesis.—The nortality is usually higher in epidemics than when the disease occurs sporadically. It is usually greater at the height of an epidemic and lower at its close. The average mortality before the sersio treatment was about 70 per cent. We know of no recorded epidemic in which the mortality was less than 50 per cent. In the last year (1905) of the New York epidemic of 1,780 cases tabulated by the Department of Health the mortality was 76 per cent. Of 59 cases treated in our bospital wants in the same spidemic the mortality was 80 per cent, nearly all these patients being under three years of age. Of \$4 cases under one year only one recovered. Of the cases seen in private practice, largely alder children, the mortality was 50 per cent. None of these had scrum treatment. Not all of those who do not die are to be classed as recoveries, for in fully 25 per cent serious sequelae remain. The results with scrum are referred to under Treatment.

Diagnosis,—Lumbar paneture is the only accurate means of diagnosis we possen. By it we can me only differentiate meningitis from other diseases with nervous symptoms, but can distinguish this from other varieties of meningitis. Furthermore, this is possible very early in the disease. With proper precautious it is practically free from danger, and it should be employed whenever meningitis is anspected. The procedure is not difficult, but the technic is important. The quantity of fluid which may be removed at one time varies from a few drops to three or four owners. During the first day or two it is usually slightly cloudy; sometimes it is very turbed and it may be thick and purulent. As the disease progresses the pus cells gradually diminish, and in favorable cases disappear, but may reappear with an exacerbation of the symptoms. These changes are much modified by serum injections.

The presence of many feacocytes in the cerebrospinal fluid indicates meningitis, which may be due to the meningscorers, but also to the paramococcus, the influenza bacillus, the staphylococcus, or the streptococcus. The variety can be determined only by microscopical examina-

Principle should not be attempted with an ordinary surgical exploring needle, but with the special bushin needle derived by Quincks. This is merely a fine troops and controls and is made stronger than an exploring needle, which may beeak. The child is placed apon the right side with the thighs tightly firsted against the abelianen to separate the spines and luminuse of the vertebrae as much as possible. The point chosen for puncture is in the median line has tucen the third and fourth lember vertebrae. This is on a level with the highest part of the diar cost. The strictest asopsis is required. The skin should be eleaned and painted with iodin and the needle hailed. The pain is no greater than from exploratory panetures elsewhere. No assorbetic is necessary for infasts, but sometimes is required for older and especially sensitive or nerrous children unless they are consistore. Local anesthesia may be employed or a few whilli of chloroform given, but always with contion, for the combined shock of the puncture and the chloroform is sometimes considerable. The child should be closely watched for at least fifteen minutes after the puncture is made. The camal is reached at the depth of about one inch. The trocar is now withdrawn and the find menalty flows frosty through the cannolis, constimes sporting Sorth some distance, owing to high pressure. A dry possestere is generally due to the fact that the canal has not been entered; nonstinue, houses the exists is too thick to flow through the small needle, or the needle may be plugged. Busing the patient to a sitting porture usually course a host flow, as does also flexing the hand upon the short if conthetonus is catrens.

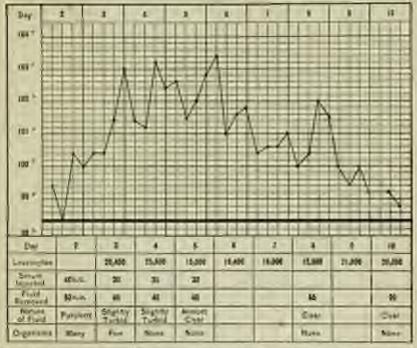
tion of stained severs from the sediment of the fluid obtained after standing or after centraluging, and by cultures, which should be made immediately after the fluid is withdrawn. In core-coopinal meningities dipheneci are found within the pas cells and some are also free in the fluid. The organisms are usually numerous.

The diagnostic value of lumbar practure, when properly performed, is very great; not only are positive findings conclusive, but early negative findings almost certainly exclude meningitis. Exceptional cases are occasionally met with in which early possetures give a clear fluid and no organisms are found; a few days later the fluid becomes turbed and organisms are alumbant. The meningococcus may persist for a long time. In one of our cases not treated by scrum it was present on the ninetieth day.

The diagnosis of cerebro-pinal meningsta by symptoms alone presents peculiar difficulties at the beginning of the attack. The most valuable early symptoms for diagnosis are, a sudden enset with intense bendarks, vanishing, high temperature, prostration, the petechial symptom, marked rigidity of the neck and extremities, with hyperesthesia, great irritability ar early stupor. Later, three symptoms are rarely wanting—persistent hyperesthesia, muscular rigidity of the neck and extremities, and fover. Kernig's sign is seen in other conditions and is not diagnostic. The spinal symptoms are more to be relied upon for diagnosis than are the cerebral symptoms. The mind in some cases remains perfectly clear; in others there is delirium, but seldem continuous, deep coma.

At its beginning, cerebropinal mesingitis may be confounded with pocuminia or other diseases with cerebral symptoms. It is differentiated with certainty only by limiter puncture. It is sometimes difficult to distinguish errelesspinal from Interculous meningitis and from arete polisureditis with meningral symptoms. Cerebrapinal maningitis is relatively infrequent except in epidemics. The fluid is usually turbed and contains many cells of the polymerphomedear variety; in tuberculous meningitis the fluid is clear and the few cells found are nearly all lymphocytes. Tuberculous mealingitis may occur anywhere or at any time. Its characteristics are a gradual onset with indefinite symptoms, low temperature, persistent dreasiness, irregularity of pulse and respiration, absence of active delirium, late coma, has marked hyperesthesia and rigidity, duration seldem over three works from the beginning of definite cordical symptoms, termination invariably fatal. Cerebrospinal meaningitis, however, frequently ends in recovery, and it is the only form of acute meningitis which does so. In policewelitis the spinal fluid resem-Mes that of tulerculous meningitis,

Treatment.—Flexuer's serum for the treatment of verebrospinal meningities more effective in sentralling the disease than any other meneurs thus far proposed. It is obtained by immunising house with toxins and cultures obtained from many strains of the meningococus. It acts chiefly on the bacteria themselves; i. e., it is a bacterislytic teramilt is used as follows: After withdrawing by lumbar puncture all the fluid that will flow readily, under the strictest meptic precentions, the erum, warmed to the body temperature, is injected without removing the needle. In some exceedingly sensitive putients the administration of



For the --Communicate Manageme Transver by Sancia Indian ? sensitioned Bullon' Boustal; 24 hours II; income procurates; requiration 80; signs of pulmonary release; general relaxation; slaper; produce beneathings employs. Pirel finid, purplient; amount removed amount of serum injected, and the changes in the finid shows in the rhare. Inconclute improvement in comprison after first injection. Subsequent symptoms typical. A rise in temperature on the 8th day and the increase in improvement on the 9th and 10th days suggested wingons in the finid was clear and no organizate could be found in smooth to by culture no more serum was given; complete possevery.

a few whiffs of eldoroform may be necessary. The injection is made by gravity, using a rubber tube and small fannel. It should be made very slowly, occupying several minutes. Baising the hips facilitates the inflow of the serum. To be effective, it must be brought into contact with the organisms in the spinal canal in a considerable degree of concentration.

The initial dose of the serum now used is 10 to 15 c. c. for infants, and 15 to 25 c. c. for children from two to twelve years old. The dose is usually repeated in twenty-four hours (in very severe cases in twelve hours) and a daily dose thereafter until four or two have been given. The indications for further injections are: continuance of marked nervous symptoms, persistence of temperature, persistence of lowestytesis and of great numbers of polymorphomeleur cells in the cerebrospinal fluid, even though no organisms are found in success and there is no growth from cultures. To introduce more serum than the amount of fluid withdrawn is somewhat hazardous. In the milder cases it sometimes happens that a single dose may suffice for a cure; but even in such circumstances it is safer to give at least three doses on successive days. The serum arrests the inflammatory process by destroying the organisms which penduce it. To accomplish this a sufficient dose must be given, and given early, before important inflammatory changes have taken place.

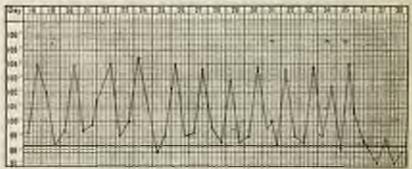


Fig. 97.—Communicated Management Late injection of the seriou, proopt effect' complete recovery. Boy, 11 source 4t. Vigorat's Boultai. New York. Early completes observe, and on account of coeffing and pain in joints diagnostic of elementum mode; correlatel symptoms not marked. First luminar pursues mode on 11th day and necessaries to found. Serious injected on the 20th and 25th days. Regid fall in the temperature fullowed by communicated of all symptoms and complete recovery.

An immediate effect of the injection is seen in the cerebroquial fluid. There is a marked reduction in the percentage of polymorphomaclear cells. The number of meningococci is greatly reduced and their situlity lessened. After the first injection they stain with difficulty, and after a second injection it is generally impossible to grow them, although they are esually present in small numbers (Fig. 36). The effect on the symptoms is often striking. There is a marked reduction in the temperature, which may amount to three or four degrees in twenty-four hours, and it may not rise again (Fig. 37). The stuper and delirium often diminish rapidly, and seen desappear. Improvement is also seen in the patient's general condition, pulse, and respiration. The last symptoms to be affected are usually the rigidity of the neck and extremities.

Intraspond injections are not wholly devoid of danger. A moderate degree of shock following the procedure is quite common. The child's head should be lowered and he should be closely watched for half an hour or more. In rare instances more serious symptoms are even, usually in the nature of an acute failure of respiration. Alarming symptoms generally some on quits abraptly with little warning, and unless promptly recognized and energetically treated death may follow. A number of theories have been advanced in explanation of these phenomena, but it seems clear that they are due to the changes produced in the intraerantal pressure. If the symptoms develop while serum is being injected, the funnel should be lowered and some of the fluid siphened out of the canal. Atropin should be given hypodermically and artificial respiration employed energetically. We have seen but a single fatal result, but in several instances it was necessary to use artificial respiration for lifteen or twenty minutes before normal respiration was established. It is evident that the greatest care should be used in injecting serum and that the possibility of the development of serious symptoms should always be kept in mind. A close observation of the blood pressure during the injection has been advocated by Sophian; its fall furnishes a warning of the development of serious symptoms. Our own apperience leads us to the belief that it is of some value, but that very careful watching of the child's pulse and respiration answers quite as well.

The results of this treatment show a much larger percentage of recoveries than has been obtained by any other method.4 Of 1,500 cases of all types, in patients of all ages treated by this serum, the general mortality was about 25 per cent. The figures represent results obtained in many epidemics in all parts of the world. The statistics from this country are not so favorable as those from abroad with the same serum, for the reason that in the results here are included reports from many physicians who, without experience in the use of the scrum, treated but one or two cases. The foreign statistics, however, are in larger groups, and the cases for the most part were under the care of men who and had experience with the serum. In the epidemic in France the mortality of the cases not treated by serum was about 70 per cent, whole in those receiving serum it was but 15 per cent. This indicates what may be expected with serum treatment under favorable conditions. One of the most striking evidences of the value of this treatment is the results obtained in infants under one year. Without serum these cases have almost invariably terminated fatally; with scram over 50 per cent of them have recovered.

The results are much medified by the time of injection as shown by the following table:

^{*}For details, see articles by Flexner and his associates in the Journal of Experimental Medicine, fears September, 1908, to 1905. Reliable serum can be obtained from the New York Health Department.

Time of Japonion	Person. (All normal charles (1, 8)	Notice (Titales.)	Degler. (Fram.)
let to lid day.	14.5%	7.14%	8.2%
4th to 7th day.	22.0%	11.1 %	14.4%
After the 7th day.	36.4%	23.5 %	24.1%

In Notter's series Flexner's serum was used; Depter used the serum prepared at the Pasteur Institute.

The effect on the course and duration of the disease is no less marked than that upon the meriality. The duration of scale symptoms is very much shortened, and in about one-fourth of the cases the disease terminated by crims (Fig. 97). This is more often seen in cases injected early, although it is observed in some injected as late as the fourth week. The infrequency of complications and sequelas is also notewarthy. Not only do patients recover, but they recover quickly, and in most instances completely. The absence of complications and sequelar is, no deads, to be explained partly by the effect of the scrum in shortening the disease.

Relayers occur in a small proportion of the cases. They are due to the fact that the organisms have not been entirely destroyed by the serum. They are usually indicated by a rise in temperature, an increase in the bucosytude, and an aggravation of the nervous symptoms. They are to be treated like a primary attack, daily injectious being repeated so long as organisms and symptoms persist.

Very little improvement is to be expected in patients who have passed the febrile stage and who are suffering chiefly from the effects of distrution of the ventricles due to a chronic baselor lexion. The most unpromising early cases are those of the fulminating type which have usually advanced so far before the serum is given that recovery is impossible. Unpromising also are cases in which a very thick puralent fluid is present which can hardly be withdrawn through the needle. The amount which can be removed is usually very small. The diffusion of the serum in the canal is difficult. In such cases Bobb (Belfast), before injecting the serum, has used with success irrigation of the spinal canal with a warm sterile salt solution. In some cases, particularly in infents, when the withdrawal of fluid by lumbar poneture has been impossible owing to adhesions or other causes, fluid may be removed by puncturing the ventricles of the brain through the fontanel. The serum is then injerted into the same cavity. The procedure is not difficult, and, if carefully done, attended by little risk. We have used it in several cases. The effect of the serum seemed quite as marked as when it was introduced in the usual manner,

In any case suspected to be cerebraspinal meningitis lumbar puncture should be made as early as possible. If the fluid obtained is purulent or only slightly turbid, the scrum should be injected at once. If the fluid is clear, the discusse is probably not corebrospinal meningitis, and one may wait for a bacteriological report. Meningitis due to the pasumococcus, the bacillus of influents, or to program organisms, may also give a purulent fluid, but no harm would result from using the serum in such a case, although so benefit should be expected.

The injection of various chemical agents (protargol, lysol, etc.) has from time to time been advocated; but the experimental work of Flexner and Amoss has shown that such substances are absolutely without value, and may seen diminish the chances of natural recovery.

Lumbur poneture per se has some slight therapeutic value. It relieves pressure and by reducing the number of microorganisms may have a slight effect upon the inflammatory process, especially when used early; but in most cases this is only temporary. An ice-cap should be applied to the boad, and at times an ice-bag along the spine. The bowels should be kept freely open. Treatment otherwise is directed toward the symptoms of the disease. Severe pain requires morphin or codein sometimes in quite large doses. For other nervous symptoms—definium, sleeplessness, etc.—the bromids and chloral, sufforal, or triunal may be given, or warm spongs or tab baths. Stimulants are indicated by a weak, rapid, and irregular pulse. Caffein and digitalis or strephonthus should be used, but not strychnin.

The nutrition of the patient is important. Feeding is often difficult, and gavage may be advantageously employed. Bed-sores should be pretented by rieanliness, frequently changing the patient's position, etc. Retention of urine may require the use of the catheter.

For the resolutal paralysis, massage, warm baths, and friction should be employed, but electricity only when all symptoms of central irritation have subsoled. The prolonged use of todid of potassium, especially in combination with mercury, seems to have some value.

ACUTE MENINGITIS DUE TO OTHER CAUSES

Besides the main varieties of scute maningitis, viz., that due to the maningococcus and that due to the tubercle bacilius, there are other forms differing in stiology, but closely related clinically, and therefore they may be advantageously considered together. It is only since the general adoption of lumbar puncture as a usuals of diagnosis that these forms of meningitis have been clinically differentiated. Formerly they were grouped under the somewhat indefinite heading of "simple meningitis." Three of these varieties, those due to the preumscoccus, the influence bacillus, and progenic organisms, are sufficiently important to require separate description. Cases of meningitis due to the typhoid bacillus, the generoccus, and the colon bacillus, have all been reported in children, but are so rare as only to deserve mention.

Pneumococcus Meningitis.-This is the most important variety included in this group and the one most frequently met with in young children. In our hospital patients about ten per cont of the cases of acute meningitis were of this form. Nearly all had pulmonary symptoms of greater or less emerity, usually a definite pneumonia with consolidation; several had also empyona. Less frequently, passamococcus pericarditis and peritonitis have been present. Occasionally pneumococcus meningitis. is seen when there are no definite polinonary symptoms or signs and when it is apparently a primary inflammation. However, in most cases postmooseus meningitis is one of the results of a generalized postmocorcus infection. In every one of our cases of purumococcus meningitis in which cultures of the heart's blood were made at autopsy, this organism was present. It was usually found in blood outtures made during life. This form of meaningitis occurs in infants more frequently than in older children, and, in our experience, usually in very young infants; over half of the cases seen were in putients under six months old. While the disease usually develops at the height of an attack of pneumonia, it may precede the pulmonary symptoms and it may develop during convalesomer. We raise saw it so late as the fourth week,

Lenous.—In a general way the anatomical changes resemble those described in excelenspinal meningitis, with the exception that the marked changes in the brain substance which are usually dependent upon the long course of that disease are wanting. As a rule, also, the besidue are limited to the brain. If the cord is involved, it is only to a slight degree.

Acute meningitis due to the pneumecoccus is characterized by a more abundant expolation of fibrin and pus than is seen in any other variety of meningitis. The lesion may affect the entire brain, but it is espevially marked at the convexity and over the anterior lobes. Sometimes it is limited to these regions, the meninges of the base escaping. The saudate may be so abundant as almost to conceal the convolutions. (See Plate XI.) There is usually less distention of the ventricles than in constrospinal meningitis.

In cases apparently primary, or when meningitis occurs very early in the course of a general pneumococcus infection, the symptoms are neually indistinguishable from those of ordinary cases of cerebrospinal meanngits. It is generally not until lumbar puncture is made that the variety of meningitis is suspected. When meningitis occurs as a secondary in-



Аничи Рекимоскости Мисколия. Сомнасатию Раксионаксисска

Child secrety menutic old; on towarty-third day of a protencied attack of postmonia, conited six times, and the temperature, which had been nearly normal for lear days, one to 500° F. On the following day general correlations, which were repeated frequently duping the most few days; rempetature, 160° to 100° F., death in maccalaines on twenty-circles day.

Late pay. Pleasuppermonals of left side: lang receiving. Anterior portion of brain exembryod in breigh and pay, recent marked at the convenient, but powent also ever the base.



flammation at is aften latent, and not infrequently is found at autopsy when not suspected during life. Usually, however, the meningeal complication is indicated by the abrapt development, in the course of an attack of passumonia, of consisting or consulsions, followed by active delirium or stupor. Because the leason is principally, sometimes only, at the contensty, many of the symptoms belonging to meningitis with basal lesions are absent. There is rarely cervical opisthotomos; the fontancl may not be bulging; pulse and respiration may not be disturbed, in fact, there are no cranial-nerse symptoms and the symptoms due to spinal involvement—hyperesthesia, regidity, Kernig's sign, etc.—are usually wanting.

The everse of preumococcus meningitis is generally short and acute, death taking place within three or four days from the first symptoms. We have accord times seen a prolonged type of the disease lasting many works; one case soded fatally near the end of the third month; another patient recovered from the acute symptoms, but remained partially paralyzed and mentally defective.

The diagnosis of presumococcus meaningitis can positively be made only by limiter paneture. The constraint fixed in gross appearance does not differ from that occu in cases due to the meningococcus. The cells present are chiefly polymorphonucleur. Pneumococci are very abundant and are easily found in smears and grown readily in cultures. The existence of pneumococcus meningitis is not always shown by lumbar puncture. We have not with one case in which repeated punctures gave negative results, and yet the autopsy showed meningitis to be present, but only the convexity was affected. The organisms were readily found in the meningial explate.

Influenza Meningitis.—This form of meningitis in many respects resembles the form just described. According to Wollstein, there had been recorded, up to 1911, all cases of pure, and 9 cases of mixed, influenza meningitis. Of these, 28 were in infants under one year old. Since then many additional cases have been reported. The disease is certainly not very rare. Of the cases which have come under our own observation, all but one have been in infants and all have ended fatally. In our experience, influenza maningitis has been secondary to other influenza infections, usually those of the chinopharyax or bronchi. The organisms were found by culture from the secretions of these parts during life. One patient, an infant of eight months, was admitted to the hospital with an acute absence of the allow joint. Two days later symptoms of managins discloped, and death occurred in three days. The action of managins discloped, and death occurred in three days. The

Assertion Journal of Dismost of Children, January, 1911.

influence becillus were obtained from the pus of the ellow, the fluid drawn by lumbus puncture, the meningral excelsts, and the heart's blood. The lumps showed influence bacilli and streptococci.

The lesions of influenza meningitis, in the few cases in which antopsess have been made, have differed in no essential particular from those described in the parameterous variety. In the cases coming under our observation in which examinations were made, the influenza bacillus was obtained from the heart's blood as well as from the cerebrospinal fluid.

Clinically, influenza meningitis usually runs a short, very sente course. There are no features by which it can be distinguished from the presumences or meningueness form, except the findings of lumbar puncture. In grees appearance the fluid does not deffer from that seen in the other forms. There is usually marked turbidity; the cells are idundant and of the polymorphomodeur variety. The organisms are gonerally not numerous in the amount, in marked contrast to the other forms of meningitis. They are readily grown upon blood agar, but not upon ordinary media. If, therefore, from a turbid cerebrospinal fluid to growth occurs, influenza meningitis should be suspected.

Meningitis Due to Pyogenie Organisms—Septic Meningitis.—Meningeal inflammations act up by the streptonorum or staphylococus are not very common in young children. They are almost always scondary. In the newly born this form of meningitis is seen in general pyenia, smally from umbilical infection; it also follows infection of a spina hifids. In older children it follows injuries to the head, crysipelas of the scalp, operations upon the brain, and stitis media with mustoiditie or sinus thrombosis. Such a complication of olitis in infancy is, however, extremely rare. The busines consist in a widespread general inflammation of the pia with an abundant exadate of pus, but with less fibrin than in the two varieties previously described.

The symptoms of septic meaningitis are not distinctive. The course is nearly a rapidly progressive one, and the termination almost invariably in death. The fluid drawn by humbar puncture in most cases is markedly turbid, and shows great numbers of pus odls. The organisms are present in large numbers and are readily recognised both in smears and by cultures upon ordinary media.

Biagnosis.—The differential diagnosis of the different forms of meningitis from each other, and from other diseases with cerebral symptrens, is made with certainty only by means of lumbar paneture, which should be done in all cases of doubt. The appearance of the cerebrospinal fluid is essentially the same whether the inflammation is due to the meningeocetic, the pastimococcus, the inflammation is due to the staphylecoccus or streptococcus. The symptoms of meningitis in general, dearribed in the chapter on Cerebrospinal Meningstis, are present in most of the cases.

Prognosis and Treatment.—The prognosis in all varieties of acute meningitis, except that due to the meningerescens, is very test; almost every case of meningitis due to other causes is fatal. From what has been said, it would appear that treatment is as yet most unsatisfactory, and is only symptomatic. Wollstein's researcies at the Rockefeller Institute, however, indicate that influenza meningitis may occasionally be controlled by serum treatment. A goal strum has been produced which regularly controls the experimental disease in menkeys. Its use in children has thus far been very seldien excension, since there is usually a general influenza septimenta and since the disease is so rapid in its course that an early diagnosis is rarely made.

TUBERCULOUS MENINGITIS

(Acute Hydrocyphatus) Bunius Meningitis)

Tuberculous meningitis is a tuberculous inflammation of the piss mater of the brain, sometimes involving also that of the cord. It is by far the most frequent form of acute maningitis seen in young shiblers. In our hospital experience, apart from epidemics of cordenopual meningitis, accounty per cent of the cases of acute meningitis have been tuberculous. It is more uniformly fatal than any other disease of early life. It is doubtful if it ever occurs as the only tuberculous lesion of the body. In infancy it is usually associated with general or pulmonary tuberculosis; in older children with tuberculous of the bones, joints, or lymph nodes. Of our own cases, forty per even of all deaths from tuberculous in children have been due to meningitis.

Lesions.—The lesion consists in the production of miliary tabercles, with which are frequently found talerculous asslutes of variable size, and in almost every case there are also the products of ordinary inflammation of the pia mater—fibrin and pus—together with an accumulation of fluid in the lateral ventricles of the brain. Frequently there are tabercles in the pia mater of the upper portion of the cond. When few in number the tubercles are usually only at the base. When numerous they are seen scattered over the convexity. Tubercles are frequently found in the choroid coat of the eye. The amount of fibrin and pus in the explate is usually small, and is much less than is seen in other forms of arute meningitis. The inflammatory products are most abundant at the base. In addition to the patches of greenish-yellow fibrus, there are adhesions between the labor of the brain and thickening of the pia. In cases which

have lasted for several weeks, this thickening may be marked, owing to cell infiltration and the production of new connective tissue. The partial is studied with military tubercles, sometimes with small yellow tuberculous nodules; frequently there is arteritis, which is sometimes obliterating.

In the most acute cases the brain substance immediately beneath the pia is intensely congested, slightly softened, and shows under the microscope a superficial encephalitis. The lateral ventricles are usually distended with clear serum, sometimes with serum containing floresh of fibrin or pos; the amount present varies from one to four cunces in each ventricle, being always greater in the subscute cases. The walls of the ventricles may be softened. The distention of the ventricles leads to flattening of the controlutions from pressure against the shull, to bulging of the fontanel, and sometimes to separation of the sutures.

Tuberculous nodules varying in size from a small pen to a walnut are frequently seen associated with meningitis in older children, but not often in infants. These nodules may be connected with the meninges, or they may be situated within the brain substance, usually in the cerebellum. The larger ones are classed as brain tumors. Inflammatory products are rarely found in the spinal canal.

Although it is not infrequent to see meningitis without symptoms of tuberculosis elsewhere, we have never Inited at autopsy to find other tuberculous lesions in the body. In our experience the following are those most often met with, given in the order of frequency: (1) In infants, associated with general or pulmonary tuberculosis; (2) in children from three to twelve years of ago, with tuberculosis of the vertebrae, hip, knee, or ankle; (3) at any ago, with tuberculosis involving only the trackeal, brouchial, or mesenteric lymph nodes; (4) much loss frequently with the pulmonary tuberculosis of older children.

Etiology.—Tuberculous meningitis is produced only by the transpertation of the tubercle lucilli to the brain. They may find their way by the blood-vessels or by the lymphatics.

The following table shows the age at which the discuse was observed in 410 cases of which we have notes:

Under one year	162
One to two years	149
Two to five years.	17
Nine to statesh years.	B
Total	416

In this series three cases were in children three mouths old or younger. Tuberculous meningitis in our experience occurs much more often in the winter and spring months than at other seasons (Fig. 98). The most plausible explanation of this seems to be that these patients, infected some time previously, carry a latent focus of tuberculous somewhere in the respiratory tract, usually in the bronchial glands. Under the influence of scute respiratory infections of the cold season, the latent tuberculous disease becomes active, and a rapidly spreading tuberculous process results. In infants and young children it rarely happens that pulmonary lesions are absent; but these patients are especially predisposed to early meningeal infection, and this often occurs before symptoms of tuberculous observance have manifested themselves. At the time of invasion, therefore, most of these children are apparently in the best of health. In other children there may have been previous evidence of tuber-



Fax 93.—Seasoner Occupancies or 300 Cases or Teamerators Managemes. Lower Curvi, Deaths from Paramonia New York City, one year.

culsois in Imps, bones, or lymph nodes. The modes of acquiring tuberenloss are discussed in the general chapter on that discuse. It is sufficient
to say here that it is usually from some member of the family or household. This may be not only a person who is in the active stage of pulmonary inherentssis, but one who is supposed to have been cared or one
in whom the discuss has not yet been suspected. Exposure may arteists
symptoms by several weeks or months. Striking evidence in favor of the
human origin of tuberculous maningitis is obtained from a study of the
type of inherels bacillus present in cases of moningitis. In thirty-two
cases in our series, this was worked set by Park and Kromwiele in the
Research Laboratory of the New York Health Department. In thirty
the bacillus was of the human type; in one it was of the bovine type,
and in one both types were present.

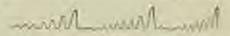
Symptoms. - In about two-thirds of the cases the onset is gradual;

but in a considerable number of those classed as abrupt, careful inquiry will elicit a history of previous indisposition. The most frequent early nervous ermptoms are, disinclination to play, drossiness, or sometimes resolved fretfulness or irritability. Often there is a complete change in disposition. In a case under our observation this was most striking; a little girl previously devoted to her mother, could not endure her presence in the room. Sleep is restless and disturbed; there may be grinding of the teeth. Older children often complain of beatlache. At all ages, but particularly in infancy, early digestive symptoms are promment. There are seen frequent attacks of vomiting without apparent rame; the borels are generally constituted and the appetite is almost entirely last. Usually there is also a slight but continuous elevation of temperature. Indefinite symptoms may last for four or five days, or they may be spread over two or three weeks without perhaps being sufficiently severe to attract much notice. Finally, unmistakable evidence of brain disease develops. The early disturbances are often ascribed to dentition, or to indirection,

In most cases the first pronounced ecrebral symptom is persistent and increasing drowsiness; exceptionally it is an attack of general outvulsions, followed in a few hours by stuper. Often a period of irritative symptoms is present, fasting several days. There is headache, usually located in the frontal region, and occasionally photophobia; sometimes pain is indicated by the child's enddenly screaming out at night, which mer be repeated many times without waking; sometimes during the greater part of the time for two or three days these frequent screaming attacks may be repeated. The skin is somewhat hyperesthetic; the reflexes are apt to be exaggerated; the muscles of the neck may be rigid and the head is drawn back, or there may be rigidity of the extremities. The pupils are normal or contracted; there may be pretagma. The child is fretful, wishes to be left alone, and cries if disturbed. In some cases those symptoms are so marked as strongly to suggest occurreninal moningitis. They may afternate with periods of marked apathy and dulness. During this stage there is occasional veniting, and the bowels are obtimately constituted. The pulse is usually somewhat accelerated, but may be slew and occasionally it is irregular. The respiration is of normal frequency, but a careful observation during sleep or perfect quiet will often show a distinct irregularity which is very significant. The imperature is noully slevated, ranging from 25° to 190,5° F. When a high temperature is seen, it is usually due to tuberculosis elsewhere than in the brain,

As the discuss advances, the irritative symptoms subside, and the stajet becomes deeper and more continuous. If undisturbed, the child may sleep a great part of the time, but can be rossed, and then appears quite rational. Finally the stuper becomes so profound that the child can not be roused at all. Active delirium is rare. The pupils respond slowly to light or not at all; they may be uniqual; occasionally there is seen strabismus, ptesis, or paralysis of the face. More often there is hemiplegia, or paralysis of one arm or leg. Such paralyses are often transient, disappearing after a day or two. Automatic movements of the extremities, particularly of the arms, are frequent. Muscular twitchings may be noticed. Opisthatomus is marked and well-nigh constant. In infants the featured is tense and bulging. In older children especially, the abdomen is retracted, giving the typical "boat-belly." After drawing the finger-nail along the skin of the abdomen, there appears a distinct red streak, which remains for several minutes. This is the titche circleule, and it is almost always present. Other vaccouster disturbances may be seen. The reflectes are variable; in the early part of the disease they are usually increased, later they are diminished or abolished. The pulse now

becomes alow and irregular, often intermittent. The respiration is almost always irregular; a very characteristic type consists in the movements



Рю. 99.—Твастое от Вименатиох из Туппъочена Манемония.

becoming deeper and deeper until there is a sigh; followed by a complete arrest of respiration for several seconds. The phenomenon is then repeated. The accompanying training illustrates the type (Fig. 99). An examination with the ophthalmoscope usually shows the presence of choked discs, and in a very considerable number of the cases, if they are closely studied, tubercles may be seen in the choroid. Their presence is of much diagnostic importance. The blood picture in this discuss is fairly characteristic. From 239 observations made in the Batter' Hospital, it was shown that early in the attack the total lencocytes are only slightly increased, they may be even below the normal. As the discuss progresses they increase in number, the average during the last week of the discusse being 29,600. The proportion of polymorphomuclears also shows a marked increase. The early range was 60 to 65 per cent; during the last week it was from 70 to 85 per cent.

The progress of the disease is subject to great variations, especially in children over two years old. The advance of symptoms is slower and is interrupted by periods of remission which may continue two or three days. After being in quite deep stupor, a child may recover consciousness, and even six up and play with toys, leading to the view that an error in diagnosis has been made. But this respite is only temporary; seen the child passes again into come.

From this time the duration of the disease is from three to ten days.

The child can not be roused at all. The pupils are widely dilated, and

do not respond to light. There is general monutar relaxation. There may be retention of the urine. Deglatition is difficult, often impossible. The respiration is more rapid, but still irregular. The pulse becomes very rapid and feeble, often 160 to 180 a minute. Toward the end the temperature often rose rapidly to 101° F., associance to 100° or 107° F. (Fig. 100). Death wouldy takes place from enhaustion in deep roma, or convulsions develop and continue from twelve to twenty-four hours until death. Sometimes a patient will live for days in a condition of prostration so extreme that death is hourly expected. A rapidly rising temperature or the occurrence of late convulsions usually indicates approaching death. Of fifty-seven cases, fifty died in come, seven in con-



Pha 100.—Fainty Tyrical Taurementes Cours in Transcripts Manusims, Eng. twenty mentle old; death on seventeenth day.

valsions. The entire duration of the disease from the beginning of definite nervous symptoms is rarely over three weeks, and in infants it is usually shorter than this.

Diagnosis.—Tuberculous meningitis is often overlooked because the patients do not give outward evidences of inherentosis. Its frequency should always lead one to suspect it when protracted nervous symptoms are present in infants. There are no diagnostic symptoms in the early stage. The indefinite symptoms that belong to this stage of the discuss are frequent in young children suffering from chronic indgration associated with constipution. Cases of cyclic vomiting may present many of the symptoms of meningitie.

The most diagnostic symptoms of tuber-ulous meningitis enumerated in the order of their frequency are as follows: persistent drownings, obstinate constitution, comiting without apparent cause, irregular respiration, irregular pulse, convulsions, spisthotomus, and fever which is invally slight. A positive diagnosis is made only by bundar puncture; by this means this form is distinguished from other forms of acuts meningitis. The fluid drawn by humber practure is usually perfectly clear, but sometimes after standing there is a slight deposit present. In rare cases the fluid may be turbed. As compared with the other forms of acute maningitis the cells are few in number. The usual cell count is from 100 to 250 per c. mm. Nearly all the cells, over 95 per cent in most cases, are monomiclear. Very exceptionally the polymerphonoclear cells are greatly in excess. The presence or absence of sugar has been in our experience of no diagnostic importance.

Tubercle bacilli are almost invariably present in the fluid, although in the early stage they are few in number and often difficult to find. But at the height of the disease by careful examination they can be found microscopically in nearly every case. They were found in 135 of 137 consecutive cases of tuberculous meningitis at the Babies' Hospi-

tal. They are more numerous late in the disease.

The technic is important. Finid should be drawn into several tubes and the last one centaining 15 to 20 c.cm, set uside for examination, as the bacilli are much more likely to be found in this. The tube should not be shaken, but should be allowed to stand for twelve hours, preferably in an incubator, A central fibrin coagulum generally forms in the fluid, and in this the bacilli are usually entangled. This should be aprend out entire and carefully examined. In other cases the bacilli may be found after centrifuging. In most of the cases the number of bacilli present is not large and a search of half an bour to an hour is necessary; but not infrequently they are so numerous that they are discovered in a few minutes.

The Boss-Jones' and Neguchi globulin tests are useful in distinguishing inflammatory from normal corebrospinal finids. They are, however, of no value in distinguishing between the different forms of meningitis. A positive reaction is obtained with great uniformity in every variety of scute meningitis.

Barilli have been found in the sputum, in our experience, in nearly one-half the case in infants and young stablism with tuberculous memingitis, although in most of them there was little or no evidence of pulmonary disease.

The v.-Pirquet cutaneous test gives reliable information except in morilland cases, in those excessively prostrated or with very poor circula-

*Luncet, May 8, 1906, p. 113.

A few maker continuous of a completely saturated solution of pure ammonium sulphate me placed in a test take and 1 cc. of corebrapinal fluid is gently run on to the surface. A positive reaction is indicated by the formation of a ring at the point of contact of the two fluids. The ring is graytch white and sharp. It should form within these minutes. Indirect illumination should be used for its detection.

man. A positive reaction was obtained in 161 of 194 cases tested. This

best is of south moistance in early diagnosis.

If, then, a stabl with symptoms distinctly meninged gives a positive reaction to the tubercolin test the probabilities of tuberculous meningitis are greatly strengthened, even though at the time bacilli may not have been found in the corresponding fluid.

The ceretral symptoms of intestinal and many other neute diseases sometimes closely rescaled those of tuberculous meningitis. From all such the diagnosis is made by lumbar puncture. In any case of meningitis in a young child the chances are greatly in favor of the tuberculous form, since it is much more frequent. The diagnosis from cerebrospinal meningitis and scate policosycletis is considered under those diseases. Differentiation from the meningcal form of policosyclitis may be very difficult, owing to the similarity of the spinal fluid in the two diseases,

Prognetis.—Although there have been recorded a few instances of recovery after tubercle bacilli have been found in the fluid obtained by lumbur puncture, such an outcome is not to be expected. We have never seen such a case resover. The reported recoveries in which the diagnosis has rested upon clinical symptoms only, can not be accepted.

Treatment.—From what has been said regarding prognosis, it follows that if the diagnosis is correct the case is practically hopeless, no matter what treatment is employed; but as a positive diagnosis is not always possible, all cases should be treated like other forms of acute meningitis.

CHRONIC BASILAR MENINGITIS IN INFANTS

It was first pointed out in 1898 by Still that this disease is usually due to the diphosocous intracellularis; in other words, that it is a chronic form of cerebrospinal meningitis. Chronic basilar meningitis is most frequently seen after epidemics of cerebrospinal meningitis, but it is occasionally not with at other times as a sequel of a sporadic case. It means after an acute attack, when the basilar lesion persists, and because absonic. As neute cerebrospinal meningitis in infants is usually fatal if the attack is secone, it follows that the chronic form is seen only after the mild attacks. It is chiefly for this reason that the early symptoms often are not recognized as those of cerebrospinal meningitis. The patient frequently does not come under observation until all acute symptoms have passed away, the persistent episthotomus being the chief feature of the case.

There is also seen in children, though very rarely, a chronic bandar

meningitis of syphilitic origin. Several such cases have some under our observation.

Lexions.—This process is usually limited to the base of the brain.

The pix mater is thickened about the interpedancular space, also over the medalla, pore, and constellars. It may be althought to the inner surface of the dara. The foramina of Magendie and of Luschka are usually obliterated, and there results a distention of the lateral ventricles with clear serum, sometimes in sufficient amount for the case to be regarded as hydrocephalus. Harely, pus may be found in the centricles. There may be a systic formation at the base of the brain due to the accumulation of fluid in one of the existence of the pix. In such circumstances

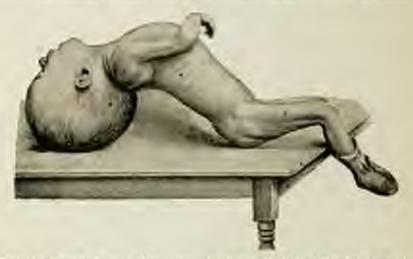


For 101.—Common Raman Mannourres—Exercise Discountry. Ill for five morehay followed combrospinal meningritis; posture shown in the picture was maintained for the last six works, death at ten months. Autopoy showed typical testinal

the perchellum is often much compressed by the fluid. The cranial nerves may also be compressed.

Symptoms.—The onset is usually gradual, although in most cases there can be obtained a fairly distinct battery of an early active period. The most prominent symptoms are corrical episthotoms, moderate hydrocephalus, and usually general muscular rigidity. The episthotoms is often extreme (Fig. 101) and is greater than is seen in any other disease. If placed upon his back the body of the child often touches the table only at the occiput and the secrum (Fig. 102). The head is usually somewhat enlarged, but never to the degree som in primary hydrosephalus; the fontanch bulges, and the autures are separated. These symptoms are due to an arenmulation of fluid in the lateral contricles. The rigidity of the extremities is very great and in most cases constant; the legs and

feet are usually extended, while the foreigns are feeed and the lands clenched. All the redexes are greatly exaggregated. There is rarely rome, but mental deduces alternating with periods of great irritability in which general consultions may occur. Vision may be impaired or wanting entirely. The fact that in most of the cases optic neuritis is about to of some value in differentiating this discuss from tumor. Nystagmen is often present and attacks of vanishing occur without evident cause. There is no fover except for a few days at a time during acute exacertations. Fluid obtained by lumbar practure is often clear but notally contains a slight excess of rolls and the globulin reaction is positive. Occasionally turbed fluid may be obtained and there may be found



Per. 102.—Canocal Bassaca Massacres: A polices in the Ballim' Hospital (diagnosis confirmed by autopsy).

a small number of meningocousi, both intra- and extra-cellular. The usual duration of the disease is from two to five months; death may occur from convulsions, or from some intercurrent disease, such as preumonia, but most frequently from maranins. The prognosis is very ball except when the came is applilia, when recovery may take plane.

Diagronis.—The desease is to be distinguished from tuberculous meningitis, and from the opisthotomus of reflex origin which is occusionally seen in infants suffering from manasmus. It differs from tubertulous meningatis in its more protracted ourses, in the absence of fever and paralysis, and also in the greater prominence of the opisthotomus and hydrocephalus.

Treatment,---H meningwood are found, anti-meningorous serum should be used. It will usually desires the organisms, although it con-

not affect the pathological changes that have taken place as the result of their long activity. If there is any reason to enspect syphilis, salvarsan and the solid of potassium and mercury should be administered. Operations for the relief of the hydrocephalus have, up to the present time, met with little measure of success.

THEOMBOSIS OF THE SINUSES OF THE DURA MATER

This is not of very frequent accurrence. It may depend upon certain general conditions, when it is usually classed as controlls at assessful thrombonis; it may be associated with local pathological processes, when it is known as inflammatory or arptic thrombonis.

Cachectic Thrombosis.—This is seen in infants and young children, had is very rare after the age of five years. It occurs in the course of various discusses, the most frequent being paramount, pertussis, diphtheria, replicities, inherculosis, and the acute intestinal discusses. In connection with the last-mentioned group, altogether too much has been made of it, as at is really rare, and in only a very few cases does it explain the correlated symptoms present. The actual rance of the thrombosis is the altered condition of the blood and the feeble circulation, as the walls of the singues are normal.

The most frequent sent of excitectic thrumbosis is the superior longitudinal sinus. At antopoy one must be careful not to confound the soft, partly decolorized, non-afterent thrombi of post-mortem origin, with those of anto-mortem formation. The latter are firm, and when of long standing may be very hard and even show a laminated structure. They usually fill the sinus completely, and are adherent. The thrombus extends from the sinuses to the wins emptying into it, which stand out like dark worms upon the surface of the brain. The brain itself may be deeply rengested, or it may be covered with a diffuse hemorrhage, but more frequently the brain and the membranes are simply obrastons.

The symptoms of cachectic thrombous are few and uncertain, and in a large number of cases the disease is latent. Very rarely is a positive diagnosis possible during life. When the thrombosis occurs just before death, its symptoms are so mingled with those of the original disease that they can not be separated. In some cases there may be localized or general convulsions, or paralysis, loss of consciousness, and strahismus.

The prognosis is bad, cases generally proving fatal in the course of a few days. The diagnosis is so uncertain and obscure that the treatment must be symptomatic, and directed toward the general rather than the local possition. Infammatory Thrombosis—Septic Thrombosis—Sinus-Phlebitis.—
This condition is most frequently seen in children in connection with near meaningitis. It may exist either with the simple or the tuberculous enriety. It also follows of the expectably old and neglected cases—nanally with necrosis of the petrana bone, but sometimes without it. It is much less frequently associated with disease of the sur in children than in adults. It may arise from transmatism, necrosis of the cranial hones, or from septic processes involving any of the cavities or any of the structures adjacent to the brain, such as the scalp, orbit, much fasca, month, or pharyna. Infection from the mouth or pharyna is most frequent in children in connection with searlet force or diphtheria; while usually accordary to otitic it may occur without it, the infection being carried by the blood-vessels. Infection from the nose may have its origin in alceration from sphills or tuberculosis. In the orbit, the source may be mulignant disease.

The sent of the thrombous will depend upon the original disease. If this affects the granial lones or the scalp, it will be the longitudinal sinus; if the rar, the lateral sinus; if the base of the skull, the orbit, the month, the jaw, or the nose is affected, it will be the cavernous sinus. When thrombous occurs with meningitis the lesions are much the same as in the curlectic form, with the exception that there are sometimes slight changes in the walls of the sinuses. If the patient has suffered from a local septic process, there may be puriform seftening of the clot, and general premia, with the development of secondary abscesses in the brain, in the longs, and in other organs. With such cases there may be associated a general or localized meningitis.

Symploses.—The symptoms of septic thrombosis are more definite than these of the orchectic form. When occurring in the course of meningitis, it neutly adds no new symptoms to those of the original discoss. In the pseudo form the symptoms are more characteristic, particularly when associated with othic. There are recurring chills with very high and widely fluctuating temperature. There is headache, and often localized tenderness of the scalp; the other symptoms which are present are mostly the same as those of meningitis. If metastasis occurs, there may be evidences of abscesses in the brain or in other organs, and sometimes there are signs of suppuration in the jugular vein. A polymorphomocker leucocytosis is usually present, and blood cultures in most cases show the presence of pyogenic organisms.

The local symptoms of the thrembosis differ somewhat according to the sinus affected; if its sent is the superior longitudinal sinus, there may be cyanosis of the face, dilutation of the temporal and frontal seins, and consetimes epistaxis; if the lateral sinus is involved, the process may extend to the jugular vein, which may be felt in the neck as a hard cord, and there may be dilatation of the veins of the masteid region, and even localized edemn; when the cavernous sinus is affected, there may be profusion of the eyeball of the affected side, edema of the lid, and with the ophthalmoscope the retinal teins appear enlarged and tortuous, sometimes being the seat of thrombosis. The process may affect either one or both sides. The course of septic thrombosis is rather irregular, varying from a few days to three weeks. In fatal cases death takes place from maningities, cerebral absence, or pyemia. The prognosis is very grave unless the disease is so situated that it is accessible to surgiced operation.

Transment.—The only successful treatment is surgical. Operation is easiest in thrombons of the lateral sinus, being much more difficult if involving the superior longitudinal sinus. So many cases are now on record of successful operation upon septic thrombons of the lateral sucus that it should always be urged when the diagnosis is clear.

CEREBRAL ABSCESS

Cerebral abscess is quite rare in children, decidedly more as than is cerebral tumor. In Govers' collection of 223 cases, only twenty-four were under ten years of age. In infants, abscess is one of the least frequent diseases of the brain, and up to five years it is exceedingly nare.

Etiology.—By far the most frequent cause in children is citie. This is the origin of the great majority of the cases. Abscess rarely complicates acute stitis, but is seen with the citronic form. Exactly how otitiss causes corebral abscess it is not always easy to determine. Usually there is excise of the petrons bone, but there may be none. The infection may extend through the small rains traversing this bone, or along the lateral sinuses to the corebellum. Abscess is often attributed to the retention of pus in the ear, but it may occur when the discharge is free.

We have seen in a young infant aboves follow usual infection, the process apparently extending through the cribriform plate of the ethmoid.

Transaction is the second important etiological factor. Abscess may be associated with fracture of the skull, or follow simple commission. The alseess is generally in the neighborhood of the injury, but occasionally is produced by coates coap. Abscess may be the result of infectious embeli, associated with general pseuda, though this is rare in early life; and finally it may occur without my assignable cause. The organisms assults present are streptococci, staphylococci, or preumococci.

Lesions.-The most frequent seat of the abscore is, first, the tem-

perosphencial like; sevenily, the cerelesium; thirdly, the frontal lobes. Other locations are very rare. Absences are usually single. In site they vary from that of a small cherry to un orange. We have seen a case in an infant in which one whole hemisphere was replaced by several large absences with thick walls, only a thin layer of cortex covering them. No cause for them could be found and the pus was sterile. The contents are usually thick greenish-yellow pus, which may be very fetid. When absences have lasted for some time they are usually surrounded by a dense progenic membrane, and may become encysted. The pathological process may be slow, and often is apparently stationary for a larg period. Absences may rupture into the ventracles, less frequently upon the surface of the brain, causing meningitis, or the pus may even escape externally through the auditory meature.

Symptoms.—These are general and local. The general symptoms are much the more important for diagnosis, and often are the only anes present. The local symptoms are those of a tamor. The clinical history of a case of abscess of the bosis may be divided into three stages: First, the period of coset, or early acute inflammatory symptoms, fever, etc., which attend the formation of past. Secondar, the latent period, or period of remission, in which very few symptoms are present; in many acute cases this stage is wanting altogether; in the chronic cases it may last for moretic, or even years. Thirdly, the final period, with recurrence of active cerebral symptoms, followed by death in a few days.

The erset may be accompanied by symptoms as slight as almost to escape notice. In most cases, however, beadache and fever are present. The headache is usually severe, and often localized upon the affected side; in cerebellar abscess it may be occipital. The fover is moderate in intensity, and continuous. In addition there may be vertige, nomiting, general convulsions, and cessation of the annal discharge, if one has been present. The duration of this stage is variable; it may be only a few days, or several weeks. It is shorter in transmatic cases, and in those which are due to pyemia.

The latent stage, or period of remindon of symptoms may be quite short—only a few days' duration—and it is often absent. During this period the temperature may fall quite to the normal, and the headache duappear, or be only occasional and slight. However, if any focal symptoms have been present they remain suchanged.

The symptoms of the terminal stage are due to a rapid extension of the inflammatory process, with edema and softening about the absence, sometimes be rupture into the ventricle, and constitues to meningitia. The fever now returns, and may be high. There is beadache, often very intense and continuous; there may be delirium and convulsions, and the gradual development of some. In addition there may be veniting. paralysis, openhotoms, retracted abdoness, and the other symptoms of meningitis. Occasionally all the earlier symptoms may be latent, and the terminal symptoms may be the only ones present. In infants, the fontanel is usually large and helping; convulsions are rather more frequent than in older children.

The local symptoms of abscess are rather indefinite, owing to its usual situation. Abscesses of considerable size may exist in the temporosphenoidal lobe, in the central part of the frontal lobe, or in the cerebellum, without any definite local symptoms. If the abscess is near the motor area, there are the usual symptoms of disease in this location: spasm, ar paralysis of the face, arm, or leg. A cortical or subcertical abscess is likely to cause convulsions. Constellar abscess may give use to occipital headache, frequent veniting, and when the abscess is large enough to press upon the middle lobe, there may be incoordination of the muscles of the extremities. Optic neutritic may be present, but other symptoms relating to the cranial nerves are twee. Localized tenderness over the scalp, when persistent, is a symptom of importance, and may serve to locate the abscess, if it is superficial.

Diagnosis.—Of the general symptoms, the most important for diagnosis are fever, bendache, delirum, and terminal soma. These become particularly significant when following stitis or traumatism. The differential diagnosis of abscess is to be made principally from tumor and moningitis, and from these conditions mere by the history and general course of the discuse than by any special symptoms. The diagnosis of abscess from tumor is considered in connection with the latter discuse. It is more deficult to distinguish between moningitis and abscess, since the two processes are often associated. With meningitis convalsions are more common, but they are rarely localized; rigidity and the inflammatory symptoms are more intense; the course is usually more rapid and more regular, being rarely interrupted, as is the course of abscess. Leucocytosis is more constant and usually more marked in meningitis. Lumbar paneture gives negative results in uncomplicated abscess while it gives positive definite information in maningitis.

Prognesis.—The prognosis in corobral abooso is always grave, unless accessible to surgical operation. The progress may be slow, or rapid, but it is inevitably from bad to worse, and sconer or later the disease, if not interfered with, proves fatal.

Treatment.—The medical treatment of abscess in its active stage is that of any scate intracranial inflammation—ice to the head, absolute quiet, free entharsis, and full does of the bronids or morphin, if pain is intense. The absolutely hopeless condition of these cases when left to themselves, and the resent brilliant results from surgical operations, should lead the physician to urge operation in every case.

CEREBRAL TUMOR

Tumor of the brain is not very infrequent, and may be seen even in milancy. From this time up to pulserly there is no period of special susceptibility. In 269 of the cases in Starr's collection, in which the uniture of the tumor was stated, the following were the varieties:

Takende	152	CAME
Gloria	- 37	-
Surroma	716	
Glioutrous		-
Cyst	30	-
Carninoma	. 10	100
Cuncia	4	
	500	
	293	District

Tuberculous tumors are more often multiple than are other varieties. Their most frequent sent is the cerebellous; next to this the pens and ceura cerebel. They are occasionally cortical or central. Gliona is most often found in the cerebellous or in the pens, and next in the cerebellous; it is rarely central. Surcous is most frequently in the cerebellous; next to this, in the senter of frequency, in the pens, the band gaughts, and the certex. Cystic tumors are either central or cerebellous. Taking the cases as a whole, the most frequent seat of tumors in children is: first, the cerebellous; second, the pens; third, the centrum scale. They mirely spring from the certex.

Tuberculous tumors are occasionally seen in infancy, but they occur most frequently between the ages of four and twelve years. They are always secondary to tuberculous elsewhere, usually of the lungs and of the breachial lymph nodes. They most frequently start from the membranes, rarely being centrally situated, and satend inward, infiltrating the superficial portion of the corebellum or construm. In more than half of the cases they are multiple. There is almost invariably localized meningitis at the site of the tumor; there may be adhesions between the dura and pin mater, and the discuse may extend to the cranial locaes. In size these tumors vary from a small pen to a child's fist. They may be softened and broken down at the center, or chose throughout. They are the result of a localized tuberculous inflammation, which does not differ essentially from that seen in other parts of the body. They rarely undergo calcifection.

Glisma is not infrequent in infancy. It repeats the structure of the neuroglia, being composed of connective tissus and branching cells. It is an infiltrating tumor whose limits are difficult to determine even under the microscope.

Sattermeta may be of almost any variety. They grow much more

rapidly than gliomata. The two varieties are very occasionally continued in the same tumor—gliocarcoma.

Cystic tumors may be the result of perencephalic softening or of encapsulated hemorrhages in early life. Gliomata and sometimes surcereats undergo cystic softening. Cysts may be parasitic in origin. The cause of many simple rysts is entirely obscure. They may be found in any part of the brain.

Curcinsensts are always metastatic and are secondary to a primary growth elsewhere than in the brain. Gummata and vascular tumors are exceedingly have until after puberty.

As the lamor grows, accordary lesions are produced in most of the traces. These are the result of pressure on contiguous parts of the brain interfering with their function, or of obstruction to the aqueduct of Sylvius or the fourth ventricle preventing the exit of fluid from the interior of the brain and thus causing hydrocephalus. Tumors in the posterior fessu are very frequently accompanied by hydrocephalus. Localized maningitis over tumors superficially situated is the role, and this may be the cause of some of the symptoms. Rarely, cerebral hemorrhage may be associated.

Etiology.—The sauses of cerebral tamors are for the most part unknown. In a few instances there is a history of definite transmitism. Sarromata may be secondary, carcinomata and tuberculous tumors are probably always so.

Symptoms.—These may be divided into two groups: first, the general symptoms, which are common to tumors of all varieties, are chiefly due to pressure and are more or less independent of location; accordiy, the local symptoms depending upon the situation of the growth.

Of the general symptoms one of the most frequent is headache. Though it varies much in its severity, character, and position, it is rarely absent. It is upt to be severe, and may continue for a long period, or it may be intermittent. The location of the pain has no definite relation to the situation of the tumor, nor is the intensity of the pain dependent upon the size of the tumor. It may be accompanied by sensations of tightness, compression, or tension in the head. It may be associated with localized tenderness of the scalp; when this is constant it is a valuable symptom for diagnosis, as it often occurs with tumors superficially located.

General convulsions are frequent in the early stage, but separated by quite long intervals; they become more frequent and more severe as the disease progresses. All degrees of severity are seen, from slight twitchings and temporary loss of consciousness to typical epileptiforms serures. They are most common when the growth is rapid and when complicating meaningitis is present. Attacks of vomiting or of localized spaces may for a considerable time provide general convelsions; and in a single action there mus be first localized and then general convulsions.

Mental symptoms are generally present in great variety and complexity. There may be only fretfulness and irritability, or a marked change in disposition. These symptoms are so frequent from other causes in children that they excite no apprehension, unless to them are added definess, apathy, and somnetenes. Later in the discase there may be attacks of inclinations or there may be periods of wild, almost maniacal, excitement; and, finally, the mental impairment may approach a condition of imbessity.

Distorbances of sleep are frequent. There is usually insomnia, but sleep may be broken by hallocinations, accompanied by attacks of screaming; rarely is there pursistent drowsiness until toward the end of

the discuse.

Optic nearities or popilio-elema (choked disc) is very frequent, scenaring in 86 to 96 per cent of the cases. This is only recognized by the ophthalmoscope, as there may be no disturbance of vision. The choked disc is generally double. It is nearly constant with tumors of the posterior fossa, especially of the cercledham. It is also very frequent with tumors of the response quadrigonism and of the parisin-occipital region. Papillo-elema is usually associated with tumors of the boar ganglia, but is late in appearance or frequently absent with tumors of the pens, corpus callesiam or convexity.

Vomiting is a very frequent symptom, but diagnostic only when it occurs suddenly without neignable cause, and without nauses or other symptoms of indigestion. Usually attacks come several days apart, often occurring early in the morning. Vomiting is especially significant when frequently repeated, and of more importance in older children than in

infants.

Vertigo is often associated with comiting. At first it is occasional and seen upon changing position, but later it may be quite constant.

repecially with tumors in the posterior from.

A slow pulse is accasionally observed with brain tumors. It may be as low as 40 or 50 to the minute. This is the result of increased intracranial pressure, and is only found when the pressure is great. It is therefore usually a late symptom. Enlargement of the head, secondary to the hydrocephalite, at times occurs. It is more apt to be found before the fontanel has closed and the autures are firmly ossified, but separation of the softenes and marked enlargement of the head may take place as late as the eighth or tenth year. Pressure of the tumor may cause erosion of the contiguous bone. The most frequent seat of this crosion is the selfa turcies with tumors of the pitnitary. This can often be made out by the X-ray, which also shows frequently separation of the sutures and digital markings on the skull, the result of hydrocephalus. Very infrequently the shadow of a temor is revealed. Diabetes inapidus is a symptom occasionally associated with tumors at the base, especially

when the pituitary is involved.

Local Symptoms.—These depend upon the situation of the tumor, but not at all upon its character. They are the result of pressure or of destruction of brain tissue. They may therefore be irritative or paralytic symptoms. Local symptoms may be wanting entirely, and they may vary much in different cases even with tumors in the same situation. They are medified by the size and by the rapidity of growth, and by the existence of localized meaningitis.

Tumors situated in the frontal lobe, as a rule, present few symptoms and may be entirely latent. Irritation of the frontal lobe may extend to the motor area and cause convulsions either local or general; but not often is there paralysis. Tumors of the left side (of the right side in left-handed persons) may cause apraxia, and when in the third frontal

convolution, motor aplasia.

Tumors in the motor convolutions along the fissure of Rolando produce the most definite and uniform local symptoms. When situated at the upper portion the leg is affected, at the middle portion, the arm, and at the lower, the face. Irritative symptoms, such as rigidity or clonic spasm, commonly precede for some time the paralysis which results from pressure or destruction. These attacks of localized convulsions begin in the face, arm, or leg; but they usually extend more or less rapidly until all three are involved. They are often followed by slight transient paralysis. Consciousness is often retained and when lost is last late in the attack. Such attacks are known as "Jacksonian spilepsy," and form one of the most diagnostic symptoms of cerebral tumer. Localized spasm may be associated with anesthesia or other disturbances of sensation. The paralysis generally first affects one extremity—the arm or leg, according to the location of the tumor—and afterward it may involve the entire side, including the face.

If the tumor is centrally located, or at the base, hemiplegia may be an early symptom from presource on the motor tract. With certical paralysis there may be associated ataxia and paresthesia or anesthesia.

Tamors of the parietal lobe may give no local symptoms. If the tumor is deeply situated there may be hemistopers from pressure on part of the optic tract. If the inferior parietal boule of the left side is affected, there may be word-blindness, or inability to understand written language.

Tumors of the occipital lobe produce, as the only constant local symptom, hemilinopsis. This is usually bilateral, affecting the same side of both eyes, being on the side opposite to that of the lesion, i. e., z. tumor on the right side rames blindness in the left half of both eyes, as that the patient sees nothing to the left of a line directly in front of him. Instead of hemianopsia, there may be only irritation and various disturbances of eight.

Tumors of the temporosphenoidal late may be latent, or, if on the left side, may come wood-deafness, i. e., inability to understand the

significance of spoken language.

Tursors in the island of Reil when situated upon the left side (right side in left-handed persons) may cause motor aphasis or disturbances of speech. If they are large they may produce symptoms by persoure upon the motor tract—homophysis or monoulegia.

Tumors of the hasal ganglia cause marked general symptoms, but none of a definitely local character. The important symptoms relate to the various tracts or bundles of fibers which pass from the certex through the internal capsule. These include the motor and the various sensor; tracts, the olfactory, auditory, visual, and speech tracts. Any of these may be preced upon, and the interval of the symptoms will depend upon the size of the tumor and the extent of the pressure. If only the miterior part of the capsule is affected there may be no symptoms; if the middle fibers, hemiplegia and disturbances of articulation; if the posterior fibers, hemiplegia and disturbances of articulation; if the posterior fibers, hemiplegia and disturbances of articulation; if the posterior fibers, hemiplegia and disturbances of articulation; if the posterior fibers, hemiplegia and disturbances of articulation if the posterior fibers, hemiplegia and disturbances in this situation are upt to implicate the cranial nerves. Optic neurities is quite constant, but may not appear early. Localized or general convulsions are rare.

The peculiar symptoms pointing to timeors of the crura cerebri are nystagonis, strabinomis, and loss of popullary redex, sometimes with general moscular inestedination, and a staggering gait. There is usually third-nerve paralysis on the side of the tumer, and on the side apposite to the hemiplegia with which it is often associated. This variety of crossed paralysis is quite diagnostic. The symptoms of third-nerve paralysis are external strabinoses, distration of the pupil, and presis-While hemiplegia is commonly present with larger tumers, it may be absent with small ones, or may appear later than paralysis of the thirdnerve.

Tumors of the pars are quite common. The diagnostic symptoms consist in crossed paralysis, the cranial-nerve symptoms being on the side of the tumor, and the general motor and sensory symptoms on the opposite side. When the sent is the upper half of the pois, the third and fifth nerves are spt to be implicated, giving rise to ptosis, dilatation of the pupils, external strahismus, trophic disturbances such as alternation of the series, and neuralgic pain in the face. Tumors in the lower half of the pans involve the eighth, seventh, and eighth nerves, making internal strahismus, contracted pupils, facial paralysis, sometimes deaf-

ness, and auditory vertige. Other symptoms associated with tumors of the pens are headache, counting and optic neuritis; convolutors being rare.

Tumors of the medulla are recognized by the involvement of the glossepharyngeal, pneumogastric spinal accessory, and hypoglossal across. There is difficulty of deglatation, irregular respiration, irregular pulse, and vascenster disturtances, such as finshing of the face and perspiration. There may be projectile consisting, polyuria or glycosuria, opisthotomus, difficulty in articulation or in sucking, and in protrusion of the tongue. Hydrocephasia is often marked. These tumors may produce symptoms of pressure upon the motor or sensory trarts—paralysis, or partial anesthesia, with rigidity and exaggerated referees.

Tumors of the pituitary gland or in the immediate neighborhood may give characteristic symptoms. These are referred to hypopituitarism, a decrease in the function of the anterior labe of the pituitary. There may be a marked deposition of subentaneous fat with a tendency to neutral dolors and with a retardation of sexual development at the time of palserty. This is frequently speices of as "Friblich's syndrome," In some children with these symptoms there is an increased sugar tolerance so that as much as 150 grams of glucose may be taken at one time without glycourus. These symptoms are usually found with benign grawths. Malignant grawths such as sarcomata are destructive and usually produce no such syndroms. Symptoms frequently associated with pituitary grawths are bitemporal hemisnopsis from presente on the optic rhiasm and later amblyopis. There may be paralysis of the extraorular massies. Hendarde is not a striking symptom and hydrocephalus is inconstant. Accomogally is earsty seen in children.

Tumors of the cerebellum are especially important, this Ising the most frequent location in childhood. When only one hemisphere is affected there may be no local symptoms. Tumors involving the middle lobe, or those large enough to produce pressure upon the middle lobe, give rise to vertigo and cerebellar staxia. Vertigo is especially frequent; it may be associated with bondards. Cerebellar stavia is different from the ataxia due to a spinal-cord lesion, and strikingly resembles that of intexicution. It may increase until the patient is unable to walk, although there is no loss of nuscular power. Vomiting is a frequent symptom, as are also optic neuritis and headards, which is usually occipital. When there is secondary hydrocephalus, as is usual, mental symptoms are present, and there may be enlargement of the head. Opentholous is recasionally seen, but peneral contributors are rare.

Course.—This is naunity progressive toward a fatal fermination. The rapidity depends much upon the character of the growth. Malignant tumors, repecially surcounts, may cause death in a few weeks.

Taberculements may give symptoms for many months but are usually fatal before that time from general military tuberculosis or tuberculous attenuages. Occasionally symptoms of brain tumor may be present for several years without any distinct advancement and then with a sudden increase of symptoms doubt may take place in a few days.

Diagnosis.—Cerebral tomor may be confounded with abscess, chronic bandar meningitis, and obtaine hydrocephalus. The symptoms distinguishing tensor from abscess are the following: Tamor may occur at any age; without definite etiology, excepting when tuberenless; the progress is steady, but generally slow, new symptoms being continually added; headache is more constant and more severe; optic neuritis more frequent; cranial nerves more often involved; mental disturbances more marked; focal symptoms are often definite; fever and louoseytosis are absent; duration, an months to two years. As compared with the above, abscess is not so frequent, being especially rare in infancy; there is a definite history of traumation or car disease; progress more irregular; symptoms often intermittent; bendache less severe; mental symptoms less marked; optic neuritis and involvement of the granial nerves less frequent; focal symptoms usually indefinite; fever and leucocytisis present except in the belief period; the most frequent complication is acute meningitis.

Chronic basilar meningitis may produce symptoms almost identical with those of tumor in the posterior fossa. It is, however, confined to infancy; hydrocephalus and opisthotoms are much more marked than are usually seen with tumor. An examination of the fluid obtained by humbar puncture will assist much in the diagnosis.

Chronic hydrocephalus may resemble tumor; this occurs so frequently as a lexion secondary to tumor that the question often arises whether there is only hydrocephalus, or there is in addition a tumor. Hydrocephalus is often congenital, is usually encountered in the first year of life and community attains to a greater degree than is seen in secondary hydrocephalus. There is an entire absence of focal symptoms. Papilla-edema is rure but optic atrophy very common.

A diagnosis of brain tumor should not be made from the presence of Fröhlich's syndrome alone. The association of the general symptoms of tumor with heromopoia or amblyopia or deformity of the sella tursica, a necessary. Many children show adiposity, sluggishness and a moderate delay in the development of the secondary sexual characteristics and eventually manifest nothing abnormal. A diagnosis as to the nature of a tumor is very difficult, but some information upon this point may be gained from the consideration of its etiology, the rapidity of the growth and the age of the patient.

Prognosia.—The prognosis of cerebral tumor is very bad. In the

death. Cases are occasionally seen which exhibit all the characteristic symptoms of turner, even including optic neuritis, which recover perfectly. We have seen several such cases. They are probably not turners but circumscribed areas of encephalitis that undergo complete resolution. An arrest of the growth very occasionally occurs in turners of a unberculous nature and recovery takes place with some function of the brain impaired. Such an outcome is distinctly unusual. The calcified tubercles that are semetimes found at autopsy have usually given no symptoms during life. Very little is to be expected from treatment unless the turner is succeptable of operative interference.

Treatment—If there is any reason to suspect syphilis, the iodid of potassium should be given in large doses and continued for a long period. Except for operative measures the treatment is entirely symptomatic. The possibility of total remotal of a growth in childhood is very slight. The chief tamors are either infiltrating (gliomata, sarcomata) or part of a more or less generalized tuberculosis. The most favorable tumors for operative removal (enlottledomata) are very infrequent in childhood. The best outlook is probably with cysts. Without operation, however, the result is so nearly always in death that if there is any possibility of removal of the growth it should be attempted. If enucleation of the growth is not possible, exceltal decompression may preserve the eight for a long time and do much to diminish the pain and general discomfort.

HYDROCEPHALUS

Hydrocephalus, or "water on the leater," consists in an accumulation of serum in the cranial cavity. This may be between the dura mater and the pia (external hydrocephalus) or in the centricles of the brain (internal hydrocephalus). The former is secondary and is quite rare, while the latter is not uncommon. Hydrocephalus may be acute or chronic.

Acute hydrocephalus is accordary to basilar meningitis, which is instally of taberculous origin. The terms tuberculous meningitis and acute hydrocephalus are sometimes used synonymensly. A moderate distention of the rentricles is frequent in all varieties of acute meningitis. The amount of fluid in acute hydrocephalus is not great, there being rarely more than three or four ounces present.

Chronic external hydrocephalus except in its mild form is extremely rare, and a nearly always a secondary lesion. It may follow maninged hamserlage, pachymeologitis, or any lesion causing serebral atrophy. It is seen in its most marked form associated with congenital malformations of the brain, particularly imperfect development of the femispheres. (See Fig. 101.) On incoming the area mater a few ounces, or sometimes even a part, of fluid may escape. The convolutions are sensexial flattened, and may be greatly atrophical. Other lessons are



Fig. 223.—Huggs to Extrange. Because and a ball months of the necessary of the Hermitians. Partied three and a ball months of the second 2015 inches increase it time. I note to the six weeks before that the projection were typical of ordinary internal hydrocurbalus. In the picture the small size of the resolution at its best judged by comparison with the orrebellant R, which is normal. The hemispheres were radioentery; the basal ganglia were normal; the cranial envir custified about one pint of floid.

found either in the brain or in the dura mater. External hydrocephalus any cause subargement of the head and separation of the estures, and in fact most of the symptoms of the internal variety; but usually it is not severe smooth to give rise to any decided symptoms.

CHRONIC INTERNAL HYDROCEPHALUS

This is the important variety, and when no qualifying term is mentioned this is the form of hydrorephalm which is always underabout.

Internal hydrosophalus may result from many different diseases of the brain and meninges. In some the amount of fluid is nuclerate and its presence aids little or nothing to the symptomatology of the condition. Tuberculous meningitis is an example. In others, such as tumors of the base of the brain, the collection of fluid may be considerable and cause definite symptoms but the primary condition and not the hydrocephalits is the important one.

Etiology.—The circlogy of hydrocophalus in many instances has been obscure. This has been largely due to the difficulty of studying brains at antopoy on account of the injury that results from their



PM. 104 - Saurital Section of 6 Mos. Car. Camp. Drive of Humocommutes, sported Dilated Lateral and Thing Verticulas and Obliversian Agencies of Statics. (From Dandy and Blackfam.)

removal unless special precautions are taken. It has been customary to decide cases of hydrocephalus into the primary, when the cause was electure, and secondary, when the cause such as tumor or abscess was readily apparent. There is no longer any justification for such a division. It seems now established that internal hydrocephalus is always a secondary condition depending upon mechanical causes. The recent studies of Dandy and Blackfan have shown that the cerebrosponal fluid is formed by the choroid places in the lateral, third and fourth centricles—but that it is not absorbed there. It passes out of the brain through the aquednet of Sylvius into the fourth sentricle and from there to the subarachnoid space by means of the formains of Magandie and of Luschka. There is an automatic regulation of production and absorp-

tion by means of which the annual of fluid is maintained at the proper level. Hydrocophalus results when the aqueduct or the foramina are obstructed, or when in consequence of injury to the manings as a result of inflammation, the corresponal fluid can not be absorbed with softwart rapidity from the subarachnoid space. In the latter instance the fluid is dammed back toward its source and the greatest pressure is thus exerted on the interior of the centricles.

Obstruction to the flow from the ventricles is frequently brought about by a narrowing or complete absence of the aqueduct. (Figs.



Pol. 105.—Saltival Receior of Normal Bards of an 8 Moories Ole Cerle, showing Parent Accepted of Stlates. (From Dundy and Blackfee.)

(0), 105.) This condition must be considered a congenital abnormality, (0) distriction of the foramina, however, is almost always the result of inflammation. This may occur in intra-interins life or at any time after birth. Except for those cases plainly following upon meningococcus meningitis, the organism causing the inflammation is unknown. Interference with the absorption of verebrospinal fluid is dependent upon some previous meningeal inflammation. It is probable that this in turn may be of intra-interine or extra-interine origin. No sufficient pathological examination of cases due to this cause has been made. It is the opinion of Dansly and Blacklan that the diminished absorption is due to adhesious limiting the size of the subarachnoid space.

In a large proportion of cases the disease is congenital, hydrocephalus beginning in the latter months of intra-nterino life. Syphilis is reappossible for a certain proportion of cases. By some authors the proportion is considered a large one. Sufficient data have not been accumulated since the introduction of the Wassermann reaction to justify a conclusive statement upon this point. In our own experience the association is not frequent,—certainly fully four-lifths of the cases are not syphilitic. Heredity is a factor of some importance, as numerous instances are or record where two children in the same family have been affected. The most obvious explanation seems to be that the same meningeal inflamreation or the same congenital abnormality has existed.

Hydrocephalus not infrequently develops after successful operations upon spims bilida or encephalusels. In such an event it is likely that an inadequate meningual absorption was compensated for by the increased area afforded by the sac of the spins bilida. When the sac is removed the absorption of fluid is no longer adequate. There is no reason to believe that neuroses, alcoholism, tuberculosis or consunguinity in the parents is responsible for hydrocephalus. The rachitic head has been so often mistaken for hydrocephalus that an erroneous notion has arisen as to the association of the two diseases. There is no stiological connection between them.

Pathology.—Depending upon the cause and the duration of the condition the amount of fluid may be small or large. It may be only a few ounces or several pints. We have seen three pints in an infant two weeks old and five pints in one who died at four months. Much larger quantities than this have been reported, but in children being several years. In composition the fluid resembles normal corelenspinal fluid. Minor changes have been reported but are not uniform. The fluid may be slightly yellow and there may be an excess of cells in cases following a recent maningitis. The effusion may become purclent from accidental infection resulting from operation, from rupture, or from infection through the sec of a complicating spina bilida.

A satisfactory examination of the brain can only be made if it is injected with formalin through the naretid arteries and two or three hours allowed to elapse before it is removed. The meninges may be normal. Frequently, however, they are thickened and there may be adhesions between them and the brain, especially at the base. The cisteran magna may, in this way, be greatly diminished in size or actually obliterated and adhesions may close the foramina of Magendie and of Luschka. The aqueduct of Sylvius may not be demonstrable. Ordinarily this is as large as a small quill. Microscopically, remains of it may be found in small islands of spendymal cells with or without a central opening. A glious has obliterated the aqueduct.

The chief charges in the brain result from the discontinuo of the ventricles by fluid. This continues until the bemispheres are destroyed to a greater or less extent. The convexity of the brain thus suffers most. The bead gauglia and corelection are somewhat flattened but otherwise relatively normal. The progressive distention results in a gradual thinming of the brain substance which forms the contricular stalls; often these are found only one fourth of an inch in thickness or the cortex may be a more shell (Fig. 106). The eposityma of the sentroic and the pia mater are at times actually in contact, all of the brain tissue having been



Fig. 166.—Verrical Transverse Sperms or a Basic of Coversorial Brissocietistics. From a child who died at the age of three weeks. At distended lateral venturies, B, its descending born.

absorbed. The brain in mich instances resembles a large double cost. In less marked cases there may be only a flattening of the convolutions. The foramen of Monro is flilated. and occasionally the formmen of Magendio also, The reptum buddem is greatly thinned or mor have disappeared. The brain is assume and the gray and white most are may be indistinguishable, The ependyma mor be pormal. It is morally ten fencialit tarbeness pale, sametimes granular and may be infiltrated with new cells. The mi-

croscopical changes are inconstant and not marked. There is a tembrary to atrophy and disappearance of the gaughian cells.

The cranium is markedly affected. The bones are often very thin; the fontanels are very large and the entures, especially those of the wast, widely separated. There may be a formation of Worman hones. After the removal of the finid which alone gives it its configuration, the head may collapse. It should not be forgotten, however, that by disciplination may oversit with premiture confication, in which case the head may be small. Pressure of the fluid upon the reof of the orbit ranses it to become less concave or even convex. When recovery source the actures and fontanels may close with the help of the Worman benes, and irregular thickening of the bones of the skull take place. The most frequent beside associated with congenital hydrosopiulus is spens belida;

more rarely there is meninguesle or encephalocele. Sometimes there are deformities in other parts of the body, such as club foot or bare-lip.

Symptoms.-- Many cases of hydrocephalus are congenital and the child may this in ofero. At other times the process may be so far advanced before both that Casarian section or puncture of the head may be necessary before delivery a possible. In perhaps the majority of cases, no symptoms are observed at birth, or the head is only slightly larger than normal. Usually, nothing is noticed until the child is two or three months old, when it is discovered that the head is increasing in size at an abnormal rate. Instead of the usual half an inch a month it may be two or three times this. If the progress is rapid, other symptoms are soon evident-the infant cannot hold up his head, he is lettargic and all his perceptions are dolled. Only in nars instances is there blindness, but there is usually some interference with eight, which is, however, very difficult to make out with young infants. Very rarely there is deafness. The pupils are usually contracted and equal, though they may be dilated. Nystagmus and convergent strabismus are often present. In severe cases the even protrude slightly and are rotated downward, leaving some of the sclera visible. This gives a very characteristic expression and is due to the alteration of the reef of the orbit. If the hydrorephalus has developed very rapidly, a popillo-edema is semetimes seen. This is, however, exceptional and colic atrophy of greater or has extent is the rule.

There is usually rigidity of the muscles of the extremities, more marked in the legs, sensitines also in the arms; the hands being elenched with the thursds adducted. The reflexes are congregated.

For a time the nutrition is well maintained, but when the head enlarges markedly, the body wastes and the disproportion between the two may seem greater than it really is. Convalsions are seldom seen. Cases which develop surfy and progress rapidly rarely live to the end of the first year, and are often fatal before six months. The causes of death are marketine, consulsions, intercurrent disease, and rarely rupture of the head.

The cases which decelop slowly are usually those that follow some meningeal inflammation. There may be a history of trank cerebrospinal meningitis. Sometimes there is only a history of unexplained fever without symptoms to draw attention to the meninges. When the symptoms develop slowly, the head may be but little larger than normal. The brain seems able to tolerate an almost indefinite amount of pressure if this develops gradually. The surprising thing about many of these cases is that the distinctly cerebral symptoms are so few. The more readily the bonus of the shall yield to pressure, the fewer are the nervous emptoms, bears, other things being equal, they are less marked when the disease begins before the sutures are firmly ossified than in the later cases. A comparatively small amount of effusion may cause very marked symptoms in a child two or three years old, while a much larger amount in an infant of a year may produce much less disturbance.

Even though the progress of the disease is slow the development of the children is greatly retarded. If the course is progressive, however, death eventually takes place, although it may be postponed for many months. The special senses are generally not noticeably affected; but intelligence in most cases is interferred with, in some only slightly; in others, very markedly, while some are idiotic. Contractions of the extremities are occasionally seen but usually more of the hands than of the legs. Sensetion is not often affected. The occurse is a very chronic one and from time to time there may be exacerbation of the symptoms.

Spentaneous arrest may occur at almost any stage. There may remain only a moderate enlargement of the head and fair intelligence, or recovery may be delayed until the head has reached an enormous size, and the child, on account of this, quite unable to move. Such an outcome, however, is rare.

Dandy and Blackfan have shown that there are two distinct varieties of hydrocephalus, one due to obstruction and the other due to diminished absorption of the corebre-point fluid. When a solution of phenolsulphone-phthalein is injected into the normal centricle the dye appears in the corebre-pinal fluid within five minutes and is absorbed very rapidly, so that 15 to 20 per cent of it is excreted by the kidneys in the course of two hours. After its injection into the spinal subarachnoid space, its appearance in the urine is prompt and from 35 to 40 per cent is excreted in the course of two hours.

In the one variety of hydrocephalus, the 'phthalein, after injection into the ventricle, does not appear in the fluid obtained by lumbar pureture for a long time, and is excreted by the kidners very gradually and during several days. If it is injected into the subarachneid space, the excretion is as prompt as under normal circumstances. This demonstrates that there is an obstruction to the outflow of fluid from the ventricles into the subarachnoid space, the cause of which may be malformations or adhesions blocking the foramina of exit.

In the other variety, the 'phthalein injected into the centricle appears promptly in the subarachnoid fluid but is excreted by the kidneys slowly and when it is injected into the lumbar region of the cord, it is also excreted slowly. This delayed absorption is the result of inflammation which has injured the meninges and diminished the area for absorption.

Prognosts, Cases developing soon after hirth and progressing rapidly are usually fatal before the end of the first year. It is very rare

that a hydrocophalic child reaches the age of seven years. The process may, however, go on up to a certain age and then cease spontaneously and the child may go through life with a load much larger than normal and usually with a somewhat impaired mental condition. In others the mentality is nearly or quite normal and yet some unusualar weakness or even paralysis persists. This arrest of hydrocephalus is probably brought about by an adjustment which has taken place by which the meninges are able to absorb sufficiently to keep pace with the production of the cerebrospinal fluid.

Diagnosis.—The most important symptom is the enlargement of the bend, and this can only be arrived at by careful measurement and comparison with the normal size. The rapidity of growth is quite as important for diagnosis as the fact of enlargement. If the head grows as much as an inch a menth there can be little doubt. The enlargement most frequently confounded with hydrocephalus is that which occurs in rickets. In the latter disease it is almost invariably irregular; there are prominences over the two frontal eminences and over the parietal botics, often with furness between them; the size of the head is chiefly due to thickening of the bones of the skull; the marked prominence of the forchead is not seen, and the increase in the hiparietal diameter is not present; furthermore, there are other signs of rickets.

Pachymeningitis interna may be confounded with hydrocephalus. The finid, however, is usually either reddish and reddish-yellow or is quite blood-stained and may contain red blood-cells. A differential

diagnosis may be very difficult.

Treatment.-If syphilis is suspected, energetic treatment by morcury and salvarsan should be instituted. In our experience, benefit from those has not been very marked and little is to be expected unless ther are employed very early. Repeated lumber punctures have, in a small proportion of cases; apparently less of value in bringing about an arrest of the process. Since differentiation between the different varieties has been possible, we have som tenefit result in cases with a free communication between the rentricles and the subgracknowd space. On a priori grounds, this is the only variety in which lumbur puncture offers a possibility of benefit. Various operative measures have been proposed. Communications have been ratablished between the lateral wentricles and the subarachnoid space. A number of cases have been treated in this way. The dangers of the operation are considerable; nearly half of the patients have died as a direct result. Of those who have survived, a few have shown striking improvement, but no complete rures have been reported.

Drainage into the jugular vein and into the subcutaneous tissues has also been employed. These operations offer but little possibility of cure. Retrogression of the symptoms is not to be looked for. The most that can be hoped is to prevent any further injury to the brain. With the knowledge that has been recently acquired in regard to the cause of this disease, there is a much greater possibility of intelligently attacking the condition by surgical means.

Cranial Deformities Associated with Hydrocephalus.—Various cranial deformities may at times be associated with a considerable degree of hydrocephalus. The two most frequent of these are oxycephaly ("specificated" or turnschoold) and scaphocephaly. In exycephaly (Fig. 107) the head is very high and short; in scaphocephaly (Fig.



Fig. 107,—Ownerman with Entremainte and Partial Barriotte, with Origin Nation Amount, Child 2 years old.



Fol. 108.—Scarnocurratar, in juding 17, months old,

108), it is narrow and elongated from before backwards. In addition to the change in the shape of the head, there may be with either form some degree of exophthalmus and optic atrophy which causes impairment of vasion. This varies in severity from slight interference with sight to complete blindness. The intelligence is usually quite normal. Smell is often completely lost. Taste very rarely is affected. These cramid deformities seem to have no effect upon the duration of life. They are not amountle to treatment and the optic atrophy is usually progressive. It is possible that cerebral decompression may retard the optic changes but this has not jet been sufficiently employed to warrant a conclusion as to its influence.

INFANTILE CEREBRAL PARALYSIS

(Sportic Diployia, Paraplogia, or Hemiployia).

Under the term cerebral paralysis are included several groups of cases with causes quite dissimilar, but having certain definite clinical features in common. While the symptomatology is quite clear, there are many questions relating to the pathology that are not yet fully settled, although much has been added to our knowledge within the last few years. Paralysis depending upon cerebral tumor, abscess, or hydrocephalus is not included in this chapter.



Fig. 169.—Environment Armoretr and Schanness or true Route Hentermone. From an infant seven and a half menths old, probably the result of a meninged bemorrhage at birth. Minteg.—Twelve hours after hirth was mixed with general convulsions, which centimed for three dian. So other completes national fill one month before death, when resistance of the left true was observed. Never held head over, Was plump and well mentioned from troop expansion. Astrony.—Fin not adherent; in large eyer assumed the espicial of the conjutal and posterior part of the puriod lobes, aboving it its floor discoloration and pigmentation, evidently from an old hemorrhage. Right eptic merce, the t, half over much smaller than the left.

The case of cerebral paralysis may be divided into three groups, according so the paralysis depends upon conditions existing prior to birth, upon those connected with birth, or upon those of subsequent development.

Paralysis of Intra-Uterine Origin.—This is the least frequent condition. In such cases there is some congenital defect in the brain, due cometimes to arrest of development, at others to such intra-uterine lesions as homotrhage or thrombosis. There may be porencephalus, or cysts extending deeply into the substance of the brain, sometimes communicating with the centrioles. The origin of this condition is for the most part unknown. In care cases the paralysis is due to certical agencies, a

condition in which the brain may seem normal to the naked eye, but the microscope shows a more or less complete arrest in the development of the cells of the certex, usually affecting both hemispheres. In still other cases there are found gross defects in development in the motor centers of the certex. Such a lesson is shown in Fig. 114. Cases in which there is conclusive evidence of intra-nitrine hemorrhage are very rare.

In most of the paralyses due to intra-interior lesions, loss of power is only one of the symptoms and usually not the most prominent. It is rure that there is not some mental impairment, and usually idiory is present. The type of paralysis is nearly always diplogic or paraplegic. When this is due to arrested cortical development, a general fluccidity of the nameles may be seen instead of the rigidity so characteristic of the other forms of excelval paralysis.

II. Birth-Paralysis.—Cerebral birth-paralysis is due in nearly all cases to meningeal hemorrhage. The primary lesions and the early symptoms have already been described in connection with the Diseases of the Newly Born. The secondary lesions present considerable variety. There may be found (1) meningo-encephalitis, (2) atrophy and advenue of the cerbes, (3) cysts upon the surface, (4) secondary degenerations in

the spinal cord.

- I, Meningo-encephalitic.—This lesion is often quite diffuse. There is thickening of the pia mater, and it is usually adherent to the brain substance. The cortex is involved to a variable degree, depending somewhat upon the time which slapess between the initial lesion and the autopsy. The following were the microscopical changes found in the brain of a child in the Babies' Hospital, who died at the age of one year of measles!: The lesions were found everywhere in the cortex. The pia true universally adherent, and shawed general cellular infiltration; its blood-vessels showed marked cell proliferation, and the seins in the sub-pial space were dilated and filled with blood. In the pia dipping in between the convolutions similar changes were present. In the cortex few, if any, normal pyramidal cells were found, but in the outer layers were an anormous number of small glia cells. Many of the blood-vessels showed a cell-proliferation of their walls. There was also degeneration in the pyramidal tracts of the laboral columns of the cord.
- 2. Already and Sciences.—These changes vary much in extent and degree. There may be only a circumscribed area in which the convolu-

^{&#}x27;The child was a first-best, delivered after a dry labor of forty-eight hours. He was applywisted, and from the first days of his life he had attacks of convolution, smally repeated many times a day. (Photographed during one of these attacks. Fig. 110.) The child had the assuptoms of typical spatic paraplegistic mass being, however, slightly involved—retarded mental development, and occurrent strategies.

tions are small, firmer than noval, and covered with an adherent pia, or there may be an atrophy so extensive as to involve a large part of one bemisphere (Fig. 169), or sensetimes of both hemispheres. Usually the lesion is somewhat diffuse over the convexity of both sides, and much more frequently of the anterior than of the posterior half of the brain. Where a depression of the brain exists the space is filled with cerebrospinal fluid, and in many cases there is a deformity of the skull.

3. Cysts upon the surface may occur alone or in connection with the lesions just mentioned. These are usually small, about the size of a walnut, but they may cover a large part of a hemisphere. Such large cysts are sometimes classed as cases of external hydrocephalus.



Fig. 151-Convensions or Spheric Panishma.

4. Secondary degenerations of the internal capsule and the lateral columns of the cord are found in most of the cases associated with extensive atrophy and sclerosis, and in many of those in which only meaingo-encephalitis is present.

Symptoms.—The type of paralysis will, of course, depend upon the extent and position of the original lesion. A diffuse lesion is followed by diplogia; one not quite so extensive by paraplegia; one affecting one side only, by hemiplogia, or even monoplogia, though this is very rare. The relative frequency of the different forms will vary according to the age at which the patients come under observation. According to our observation, which have been chiefly upon infants, the cases of diplogia and paraplegia have outnumbered those of hemiplogia more than four to one. The great majority of the congenital cases, or those due to hymorrhage occurring at birth, are without doubt diplogias or paraplegias, and very many of them succumb during the first two years; however, the cases of hemiplogia, because of the less serious lesion, live much longer. Diplogia and paraplegia will therefore be considered as

the characteristic types of corebral herth-paley, as the cases of hemiplegia do not differ from those due to later causes—i. a., the acquired form.

In the most severe cases that survive the symptoms of the early days of life there remains some rigidity of the extremities, chiefly of the legs,



Pic. 111, — Strayer Panartasta, Child two and one-half your old. New York Pounding Blooptal, analist to walk or even to stand without noticiance. The inbitual position of the limbs, which is due to strong addition spann, in above in the parture.

which is constant or intermittent, slight or well marked. There is often spaem of the muscles of the neck and trunk. giving rise to opasthotomus. In many cases there are frequent attacks of convulsions. The general physical development of the child is often interfered with, so that he remians small and delicate, or perhaps dies of some acute disease in early infancy, never having been able to sit erect, or even support his head. In other cases the general nutrition is not affected, and life may be pealonged indefinitely, but usually with some mental impairment. This is seen in all degrees; it may be so slight as not to be noticed until the child is two or three years old, or the child may be idiotic. Often these children are not able to stand until they are over three years old and do not walk alone until they are four or five years old, and then with a peculiar cross-legged gait, owing to spasm of the addresses of the thighs. This may be so great as entirely to prevent walking, and while sitting or lying the thighs may cross each other. These form the typical cases of spartic paraplegia, semetimes called "Little's discase" (Fig. 131). All the reflexes are greatly exaggerated. The arms are

much less affected than the legs, and in about half the number they are not involved at all.

In the milder cases the early symptoms may be overlooked, and nothing exerts suspicion until the infant is six or eight months old. There is then discovered annietakable muscular weakness; the child does not sit up, or even hold up the head when the trunk is supported. Often there is observed before this time a tendency to stiffen the body and to these the head backward, owing to spasm of the certical or spinal mus-

eles. The immediar weakness is often mistaken for rackets, or regarded simply as backwardness. A closer examination usually discloses the presence of some rigidity of the extremities, particularly of the legs, and congguration of the knee-jerks. As the child grows obtar other symptoms of imperfect development become more and name exident.

There are changes in the shape of the skall, this being resually smaller than normal in all its diameters, or there may be asymmetry. There is an arrest of development in the paralyzed timbs. These are both smaller and shorter than normal. In many cases almost all necessaries are seen, which may be of an irregular chiercic type, or they may be atheteoid Epilepsy develops in from thirty-three to lifty per sent of all these patients.

111. Acute Acquired Paralysis.—This is usually of the hemiplegic type, although diplegia and paraplegia any in rare instances be next with. This group includes cases developing at any time after hirth, but the great majority of those seen in chaldhood larger before the fifth.

year.

The etiology is often obscurs. The paralysis sometimes follows transmittion. It is occasionally seen in the course of searlet force, measles, diphtheria, varioh, passimonia, or pertures. The frequency with which these cases are subsered in with convolutions has led many to assign this as the same of the paralysis. It is probable that the convolsions are more often the result than the cause of the boice. In the acute inflammatory cases the cause is probably the same as in acute polinmyelitis.

Larious.—The lesions of arone corolinal paley may be grouped under three heads; (1) those of the blood-reside; (2) those of the membranes;

(3) those of the brain substance.

1. Lesions of the Blood-vessels.—There may be beneathage, embelism, or thrombosis. Hemserhage is by far the most important. It is usually meningeal, rarely cerebral. It occurs more frequently at the convenity than at the base, and is often diffuse. Meningeal hemorrhage may result from packymeningitis. It may be due to tranmatism, when it is also from the dura mater; or from the scate hyperossis accompanying paroxyme of pertussis, when it may be from the dura or the pia; or it may be secondary to thrombosis of the superior longitudinal simus. The association of hemorrhage with sinus-thrombosis is not very infrequent. It was found in two of our autopases upon patients who died of pneumonia. Cerebral hemorrhage is extremely rare, but it occurs even in young infants.

Embolism is rarely found unless associated with acute rheumatic endocarditis, and then usually in children who are ever seven years old. As in adults, the usual seat of the embolus is a branch of the middle cerebral artery. Thrombook has been met with in a small number of open, but it extremely rare.

‡ Lemma of the Membranes.—These are generally the result of an old combrosporal memorgitis; assertions they may be of syphilitic origin. In both, however, the process is rarely confined to the memlemes; it is a memorge-encephalistic.

3. Lecture of the Benin Substance.—Atrophy and referreds are found in a large number of the nanopoles made upon cases when the paralysis



Fig. 112—Receive Manyonia Brismanitor. Besix of an infant seven manche old in the Bulker's Bospital. A, parents beneritages, B, Broundand years, C, dillar enterviolation.

has been of long standing. They pepresent terminal conditions, however. They vary in severity and extent, and are followed by secondarr degeneration in the tord, as in cases of birth paralysis. There may be the same development of cysts of the pin mater, or an accumulation of fluid in the araclinoid cavity, these taking the place of the atrophied convolutions. The nature of the primary lesion in these cases is not always clear. In a certain number of them it is an acute poliencephalitis, analogous to acute peliomyelitis, and probable due to the same varies. The corebral lesion may be associated with cord

lesions or it may event alone. Their nature is considered in the chapter on Poleomyclitis. In still other cases a chronic diffuse encephalitis with atrophy to found at autopey, closely resembling the conditions which follow a messageal benorrhage occurring at hirth, yet the children were normal up to the account or third year, and there was no neate onset.

Acute paralysis constitues occurs for which no explanation can be found at autopsy. An infant with paramonia was admitted to the Babies' Hospital, who had developed, a few days before, typical right hemiplegia. It came an autobaby, with convolutors, and involved the face, arm, and leg. The arm and by appeared to be completely paralysed, but in the face the paralysis was incomplete. The paralysis

had begun to improve somewhat at the time of the child's death, which occurred a little over a week after the onset. At the autopsy to gross lesion could be discovered. A careful microscopical examination was made, and nothing absormal was found except a slight increase of small spheroidal cells absert some of the meningeal and cortical vessels of the motor area. Such cases are most likely a cerebral form of poliomyelitis.

Symptonia.—While diplegis and paraplegis are occasionally seen, the great majority of cases of acquired cerebral pulsy are of the hemiplegic variety. When diplegis and paraplegia occur, it is usually in early infancy, and their symptoms and course differ in no wise from the birth pulsies. We may therefore regard beniplegia as the chief mani-

festation of acquired cerebral pulsy.

The coast of the paralysis is almost invariably acute, with convulsions, which are usually repeated, and in severe cases followed by loss of consciousness. In the secondary cases these are generally the only symptems. In one of our cases the patient went to bed apparently well, and awoke in the morning with hemiplegia. Such an onset, however, is very exceptional.

When the paralysis is due to arute policacephalitis, the oract is usually with high fever, comiting, often convulsions, followed by delirium or stuper. These general symptoms continue for a variable time, usually two or three days, before paralysis is seen. The temperature in most cases is from 101° to 103° F., and the fever sometimes follows, sometimes percedes, the convulsions. The loss of consciousness may last for several days, and the paralysis is frequently not discovered until consciousness is regained. If there is a very extensive lesion there may be diplogia, deep comm, and death, but this is very infrequent. Usually the lesion is more limited, and the symptoms are those of typical hemiplegia. The face semetimes escapes, and if involved it generally toon recovers. The paralysis of the arm and log is at first complete, but may improve rapidly in the course of a few weeks. Disturbances of sensation may be present, but are usually of a transient character. After a variable period, from one to several weeks, the patient begins to use the paralyzed extremities, first the Jeg, afterward the arm, as in solult beniplegia. The convulsions may be repeated for the first day or two, but prolonged or continuous convulsions are rare. They may be general or unilateral. With lexions of the left side of the brain, speech may be affected, and not infrequently in young children when the locion is upon the right side. The reflexes are increased upon the affected side, and a slight ankle-closus may be present.

After a few weeks the child may be able to walk, dragging the affected leg. The recovery in the leg is constitutes complete, but in most cases a slight bult in the past remains. The arm usually recovers more shorly than the log, and contractures are likely to detelop after a variable time, generally two or three years. In Fig. 113 is shown a characteristic determiny of the upper extremity. Contractures of the leg lead to mesons forms of talipes, generally equipms, from shortening of the tendo-



Pro. 162 — Deponents of Less Hors and Besett of Cosmosotrans Following as Arrives of Humanous, Form Years Surons, Child selve years old.

Achillis. Sometimes the arm or the leg recovers so perfectly that the case may be regarded as one of monoplegia. In old cases the paralyzed limbs are atrophied; there is more or less regidity, and the spastic condition may be quite marked. We have seen this limited to a single group of muscles in the leg. Aphasia is common in right hemiplegias, and it is not very rare in those of the left side, because infants appear to use both sides of the brain with rearly equal facility.

The mental condition of these children is often normal, in striking contrast with the cases of congenital displegia. The earlier the paralysis occurs the more likely are mental symptoms to be present, since we have here not only the direct effect of the lesion, but an arrested development of some part of the brain. Epslepsy is not an amounton sequel; it may be of the Jacksonian type, or there may be attacked figural convolutions. In other cases there are post-bemiplegic movements of a choreic or athetoid character, or irregular incoordinate movements.

Prognosis of Infantile Cerebral Paralysis.—In diplegia and paraplegia the

outlook is always unfavorable. A very large number of these cases which are due either to intra-uterine or hirth besions never reach the third year, but due in infancy from malautrition or neuto intercurrent disease. Those who survive usually show serious mental defects, and many are practically helploss on account of the extreme specie condition of the muscles of the extremation.

In homplegia the prognosis is much more favorable. In most of these cases the paralysis is of the acute acquired variety, and the later the period of onset, the less likely is the brain to be seriously damaged. In some of these patients complete recovery takes place; in others the residual paralysis is so slight as to be easily overlooked except on careful examination, the occurrence of epilepsy being perhaps the first thing which leads one to suspect that a previous paralysis has existed. The great majority of children who have suffered from infantile cerebral pulsy have some degree of permanent paralysis and usually some deformities from contractures, the extent of both varying, of course, with the severity of the primary beston. In all cases seen in young infants it is exceedingly difficult to give a progressio in regard to future mental development. As a rule, the impairment is directly proportionals to the extent of the paralysis and its intensity.

Diagnosis.—The diagnosis between the congenital and acquired forms of cerebral pulsy is of no great practical importance, and it may be impossible; for the symptoms in congenital cases are often not sufficiently marked to attract attention until children are chi enough to sit alone or to walk.

It may be quite difficult to distinguish ceretral paralysis from infantile spinal paralysis. The history of an acute court, the atrophied limbs, the deformities, and the absence of sensory disturbances, may be found in both conditions. Spinal paralysis is, as a rule, monoplegic, and often affects but a single group of muscles. Ceretral paralysis is either diplegic or hemiplegic in character, and even though only a log or an arm may ment to be affected, a critical examination will smally recent the fact that the other limb of the same side has also suffered. The presence of rigidity and congretated reflexes is quite as important cridence of this as less of power. The electrical reactions, however, are samily conclusive; the reaction of degeneration is absent in cerebral paralysis, while it is usually present in spinal paralysis.

Simple as the differentiation may seem in most cases, the mistake is frequently made of confounding cerebral diploma, particularly of the faceof type, with rickets. Cases of acute acquired paralysis at the onset may be mistaken for acute meningitis, but early less of conocosances, the early development of the paralysis, its permanent character, and the shorter duration of the acute symptoms, usually distinguish these cases from those of meningitis. The only definite means of differential diagnosis is by lumbur paneture; this gives negative results in cerebral paralysis and positive results in meningitis.

Treatment.—The course and the results of coroleal paralysis depend upon the extent of the injury to the brain, its nature, and the age at which it is inflicted—all these being conditions which are beyond the power of the physician to modify or control. The treatment of cerebral pulsy is therefore extremely unsatisfactory. For the congenital cases practically nothing can be done, except for the deformities and complications. The acquired cases during the acute cases are to be managed like all other cases of acute coreheal congestion or inflammation—absolute rest, see to the head, and bromids. Electricity is not to be used in early cases, and little or nothing is to be expected from it in the late ones. Much can be accomplished in an educational way for the mental derangements resulting from coreheal palsy. An important part of the treatment relates to the deformities. Many of these may be prevented by the tarly use of orthopolic apparatus. Serious deformities in eld cases may be greatly benefited by tenotomy or myotomy, followed by the use of suitable apparatus. The results of all other operative measures have been in our experience most unsatisfactory. Epilepsy is to be treated as when it depends on other causes.

AMAUROTIC FAMILY IDIOCY

Amourable family bloom is a relatively rare disease. It is confined, almost, if not entirely, to the Jewish race. It shows strong familial tendencies—aften two or three and cometimes even four or five children in the same family dying of the disease. There are no other known etiological influences.

The first symptoms are usually noticed between the sixth and the tenth months, up to which time the infant has generally appeared normal. At first it is only noticed that the child is making no progress in his development, or that his crosight is not so good as formerly. He ther not gain in shillty to sit up or to me his muscles; he lies quetly, does not respond as he come did, and takes less interest in his surroundings. After a few weeks it is clear that the child, instead of advancing. is actually retrograding both physically and mentally. His muscles become so weak that he can no longer sit up or even held up his head. Vision becomes less and less fibring; the child no longer recognizes the faces of friends or objects shown him. Finally, he becomes dull, apathetic and quite indifferent to his surroundings; then it is erident that he can not see at all. In the early stages the muscles are usually weak and flaurid; later there is rigidity with increased knee jorks and often marked spacticity. Children with amaurotic family idiocy are often (at and well nourished, but with the onest of weakness loss of weight occurs and eventually this may be so extreme that the emiciation may be a prominent factor. There may be general consulsions. The characteristic features of the disease are revealed by the orbithalmoscope. Occupying the place of the macula lutes there is a large, malky blue or white area with a length cherry-red spot in its

center. With this there is also strophy of the optic discs. The ocular

changes are symmetrical.

The outlook is absolutely bad. The disease is progressive and annually fadal within a year from the time when the first symptoms are seen; but occasionally the blind, helploss child may live for several years if feeding with the stomach take is resorted to, for swallowing executable may become quite impossible.

There are characteristic pathological changes to be found in the cells of the central nervens system. The brain itself is not diminished in size, but is more firm and elastic than normal. The same is true of the cord. Microscopically, the gangion cells abow a marked and striking acgeneration. They are excellen, their protoplasm is undifferentiated and the nucleus is excentrically situated and degenerating. There are oftentimes large, evoid swellings upon the cell processes. Ultimately the nerve cells disappear and are replaced by avaringlia. These changes are very wide-opened and are found in the retina as well as in the brain and cord. In many cases hardly a normal ganglion cell may be found.

To be differentiated from annurotic family bloop is a less frequent form of degeneration, known as "familial macule-cerebral degeneration." It attacks several children in a family and at about the age of six or seven years. These children become dull, stupid, lose their power of attention and eventually their ability to read, speak or even recognize people. With these symptoms there is a central sections which may be of high degree but does not produce complete blindness. The physical condition of the shild may remain normal for a long time. The eyes show a combination of strophy of the retina with pigmentation especially in the region of the margin. The condition is insurable. It is progressive, though the patients may live many years. Death occurs from intercurrent infection rather than from the disease itself.

MENTAL DEFICIENCY

(Idiocy-Imbedity)

By mental deficiency is meant any interference with intelligence or a limitation in the adaptation of the child to his environment. This interference with intelligence may occur in children as the result of various general diseases or those confined to the nervous system. In other chapters the mental deficiency occurring secondary to general diseases and also to organic disease of the nervous system, such as hydrocophalus, chronic meningitis, purson, messageal hemorrhage, etc., is discussed. The present chapter will treat only of mental deficiency

as an apparently primary condition.

Of all the factors that operate to produce mental deficiency, heredity is the most important. This statement does not require substantiation. It is generally recognized. The descendants of mental defectives may be normal, they may be so delective that it is readily appreciable in the first year or two, or the disturbance of montality may be so slight that it can be recognized only after several scars of life. The influence of parental alcoholism, especially chronic alcoholism, has been much discussed and there is a wife difference of opinion in regard to it. Some claim that it plays a distinct part in the production of feeldsmindedness; some, that it plays lettle or none. It were to us that it is a factor of some importance. While it cannot be entirely ignered, it certainly does not have the influence that has been ascribed to it by many. Whether syphilitic infection per se tends to produce mental deficiency is open to question. It does not appear likely that its influence can be great onless it produces organic changes in the meninges or in the brain itself or in the blood tessels. Poverty, poor surroundings, had atmosphere, etc., have been claimed to bute an influence by affecting the health of the mother. Associated with these are almost always other factors such as heredity and alcoholism that probably have much more effect upon the offspring.

The changes to be found in the brains of defectives are of all degrees of severity. (Fig. 111.) There may be an atrophy of one or more portions of the brain, failure of development of one bemisphere, poorly developed convolutions and shallow sulci. In certain cases no changes are in be made out macroscopically. The position can be well maintained, however, that even in such cases, mental deficiency is dependent upon actual organic changes in the brain, for practically all observers have found, as fiel Hammaberg, that even when no gross alteration was apparent the ganglion cells were infrequent and poorly developed.

There may be all guides of mental deficiency. It is usual in this country to separate mentally defective children into three groups: (1) the divide, those that inver develop beyond the mental age of an average child of two years: (2) the indecides, those that never acquire a higher degree of mentality than the average child of aven, and (3) the assesse, who do not acquire a higher degree of mentality than children of twelve.

It is frequently accessary for the physician to determine whether or not a child is mentally deficient. In doing so it should be remembered that normal mental development is very dependent upon physical development; but it does not necessarily go on with equal rapidity. If an infant has been paramture or hadly nearished for many months or has suffered from some very accore illness, he may at the end of a year show no more mental development than an average child of six or eight menths. Yet, with improvement in his physical condition his mental condition also improves so that eventually the normal is reached. There is a wide variation in the rapidity of development of vormal children. Some are quite slow, especially in certain families. Proper atten-



PM. 114.—Assurery Development of the Property Londs of the State, Particu-Lancy of the Room See. From an ideals could be due to make add.

tion should be paid to this fact and too much emphasis should not be placed upon only dight deviations from the normal. The abnormal infant is distinguished not by slight, but by gross deviation from the normal. A high degree of mental deficiency can usually be recognized very early; the lesser degrees require longer observation. Even those chaldren that are only slightly affected often give some definite reidence of it during infancy. Their mental development begins late and usually

[&]quot;Mirrorcopical Examination: Cortex in affected region one-third normal thickness; normalization and white orbitance mornals striking absence of chap-actoristic nerve cells; very fee large or annull paramidal cells present.

ends early. It is fair to assume that those whose mental development, in the absence of sofficient physical cause, is abnormally delayed, will suffer some permanent impairment of the mental faculties; but awing to the differences in the length of time that improvement may occur in different children, it is impossible to predict closely as to the final outreme.

To appreciate the abnormal, one must be familiar with the mental and objectal development of normal children. Mental development shows itself in the muly months of tife chiefly by the acquisition of the shility to do certain physical things. The normal child about the third month begons to grasp objects—at the fourth month he recognizes people, between the third and fifth months he holds his head up firmly, at the liftle month he reaches for things; holds them in his hards and







Fro. 116



Fuo. 117.

Fac. 115.—Boy review years side, microscophale; walked at about four years; can real and write; development like that of a normal child of eight years.

Fig. 110.—Micropolasic, seem years old, understands must of what is said; easied.

talk involigibly.

Fig. 117.—Gist of right years; indeeds; comes walk without help.

observes them. From seven to nine months, he site alone, and laughin play. From nine to ten months, many children stand. At a yest they often begin to walk and to repeat single words. The mentally deficient child, on the other hand, may not even hold his head up at the end of a year. He makes no attempt to grasp objects, perhaps helds them for only a moment and then drops them. He cannot sit alone, he does not attempt to stand, and does not recognize people until perhaps the end of the second year or very much later.

Some mentally deficient children are exceedingly placed; others cry continually without apparent cause and are often exceedingly restless. The expression of the normal child is intelligent, bright and alert; the abnormal (Figs. 115, 116, 117) may be nay his lack of mental capacity by his vacant, stored expression, his open mouth, protruding tongue, dreeling and his irregular, aimless movements of the bands. As time you on, mentally delicient children not only remain backward in things that they should do, but they also do things that normal children do not de. They develop acreaming attacks, they throw their heads backward or frequently stiffen out. Strahismus is often present and there may be illdefined attacks of a convulsive nature or typical convulsions.

It may be exceedingly difficult at times to differentiate between the nerely backward child or the mentally deficient. The backward child is usually distinguished chiefly by the things which he does not do. He does not show an abnormal mentality. Children merely backward as the result of disease may not be able to talk until two years old or may. not walk until after that time, set may understand what is said and done for them; their expression is normal; they seem bright, and the development, although slow, is steady and progressive. Mentally deficient children, on the other hand, are not only very backward, but they usually reach the end of their development fairly early and it is not a complete development. As Scholz says, "the mentally deficient child of threfre is not a normal shild of six; he is not morrly a dwarf, but a cripple." This becomes increasingly evident as the defective child becomes older and his character and mental processes find better expression. He may be disobedient, usually, untrustworthy, cruel to animals. and playmates, not interested in the play of children, and may not conform to the collinary standards of elembiness and neutress. Most of the children are clumsy in their movements and especially not destrous with their lands. There are many shiblesn, however, that are docile, kind and affectionate, but whose faculties are totally inadequate when compared with those of the average chibl. One with experience in testing mentally deficient children is able to tell with a considerable measure of acrumcy what their mental capacity is. This is accomplished by observation and various tests, including the Binet-Simon test. This standardizing need not concern us leve; but all physiciana should be in a position to recognize the abnormal. The standardization of the abnormal and particularly the training should be in the hands of experts in that field.

MONOGLIAN IDDOCY

A form of mental deficiency that can be at once recognized by the physical characteristics of the child is the so-called Mongolian Idiocy, also known as "Kalmack Idiocy," The cause of this is obscure. It cannot be shown that it is due in any way to syphilis or to the excessive use of alcebel in the parents. The condition appears with equal frequency in the series. It is found in the Cancasian race and we have seen several instances in the colored, but it has apparently not been reported among the Malay or Mongolian races. The factor of greatest importance is the age of the mather. The majority of Mongolian aliets are born to

nomen over 15 years of age. The number of pregnancies also appears
to have an influence. These stablers are not infrespently the last after
the bests of a number of healthy children. Much less frequently, they
are the first, but the number of first or last children that are Mongols
is greatly in excess of those in the middle of families. It is evident that
the reproductive function has an important bearing upon their development. They are probably the result of incomplete or inhibited development, and have been called by Shuttleworth "exhaustion products."

This is one of the common forms of mental defect, apparently more frequent in England and in this country than elsewhere, perhaps on

Museuius Tress



Fra. Hs.



Pop. 119.



Pio. 128.

Bys. 118.—Six mounts sid; died at tuenty-two mouths could not hold up the lead, at tenterstand sarrhing.

Fig. 109.—Boy, recently-one possible oid: did not hold up his lead until eighton months; parental development that of a child of eleves or twelve usuallis.

For 120.—Girl four years old; mound development like that of a memol child of two and a half years, walto very awkwardly.

account of closer observation, as the result of the frequent attention that has been called to it.

Pathologically, the bount are, as a rule, small. The convolutions are poorly diveloped and there is apt to be an aphreis of some paris, such as the cerebellum, peak or medalls. The cortex is frequently thin and the ganglion calls few in number, with rather sensity cell processes.

The appearance of these children is very striking (Figs. 118, 119, 120) and it can at once be seen whence they have derived their name. There is a possiliar Mongelian type of countenance; the syes are set cloudy together, they are shuting and the palpetral factores narrow. There is frequently opicanthus. The head is brachycephalic and small At twelve months it is after two inches below the average in circumference. The children are short for their age. Their hands are short and thick, especially the finger; the little finger, not uncommonly, is so short that it does not reach to the last interphalangeal joint of the ring larger. The massless are poorly developed, and there is a great relaxa-

tion of the ligaments, so that the strangest and most uncomfortable positions can be assumed at will and often by preference. The tongue is usually prominent, slightly protruding and deeply fishered. There is usually drouling from the mouth and often a most discharge, so that the lips may be greatly executated. Mouth-breathing is nearly always present. The mostpharyny is often small, constitues owing to backward projection of the corner, sometimes to a forward projection of the bodies of the cervical vertebras. A very moderate amount of adenoid tissue may produce marked symptoms of most also truction. The expression is aften that of a child suffering from very large adenoid growths, and sometimes the early cases are possed over as simply "adenoids with mental dulines." Other defects are often associated. The cars are frequently missiapen; congenital malformations of the least are quite common; in one of our cases there was absence of the patella.

Mangolian idiots are very backward in development. They frequently do not hold up their heads until a year of age, or later, and may not walk until the end of the second or third year. Speech is greatly delayed and seldom normal; although almost all, if they live sufficiently long, do eventually talk to a certain extent. These children have but little resistance to any scute disease. They are particularly susceptible to infection, and the majority die in unfancy or early childhood. We see many of them as infants and few after the eighth or tenth year. They succently chiefly to pulmously infections or to tuberculusis. There is a certain degree of variation in their mental capacity, but it is singularly slight, and, as the majority of them look much alike, so also their mental processes are alike, and very few of them reach a higher mental development than that represented by a normal child of four or five years. They are restless, mattention, and can be taught with great difficulty.

DEAF-MUTISM.

Excluding the cases in which idiocy is present, which are not considered in this chapter, deaf-mutism may be the either to congenital or acquired conditions; the larger proportion of the cases belong in the latter class. When congenital, deaf-mutism may result from unitis, or perioditis of the temporal bone, encrosching upon the ravity of the middle car, from ankylosis of the oscirles, from absence of the internal car or any of its parts. There may also be called degeneration of the labyrinth. It may result from atrophy of the auditory nerve, and it may be due to a lesion of the brain. These congenital conditions are often hereditary. An investal form of congenital deafness is occasionally present with gotter. It is found especially in these regions in which

guiter is cademia. Its cause is unknown. Acquired deal-mattern is most frequently the result of searlet fover, and is due to outse. The second important cause is cerebrospinal meningitis, where it may be due to a losion of the train, the auditory nerve, or the out. It occasionally follows manners, dephtheria, measles, and other infectious diseases. It may result from reported attacks of acute utitis associated with adenoid growths se chronic rhanophertugitis.

The younger the child at the time the deafness occurs the somer the perser of speech is lest. In most of the infectious diseases, if the attack occurs before the fifth year, speech is lest. According to Love, total deafness is rare among deaf-mutes; hearing for speech is present to a useful degree in about twenty-five per cent of the cases, while bearing by crantal conduction syste in nearly all came. Deaf-mutism should be suspected if a child not blickic shows at the end of two years no signs of beginning to talk. A careful distinction should be made between deaf-mutism and iddeer resulting either from congenital conditions or acquired discusse.

It is necessary that this condition be recognized as early as possible, in order that the child may have the advantages of proper training during his early years. The physician should insist upon the child being sent as early as the third, and certainly by the fourth year to an institution where he may be taught to speak.

The treatment is mainly peopleylactic. The most important relates to the cure of the curs in courlet fever, and the removal of adensid vegetations of the pharyex and other causes which produce attacks of scate or chronic otitis. For the condition itself education is the only thing to be considered.

CHAPTER IV

DISKASES OF THE SPINAL CORD

MALFORMATIONS

Maliforniamous of the cord are very frequently associated with those of the brain, and hear a certain degree of resemblance to them. (1) The cord may be absent (anayella); this condition may exact alone or with absence of the brain. (2) The lack of development may be only partial (atchonyella), as when some of the tracts are wanting. The next important one is defective development of the lateral tracts, which may be a course of spartic paragraphs (Charcot). (3) There may be a nonlycotion of some of the gray number (beterstopia). (4) There may

he a double cord (diplomyelia); the division is generally incomplete, and is attributed to an abnormal development of the central canal; it is usually associated with other deformation. All of these malformations are extremely rare and of very little gractical interest.

There remains to be mentioned the only one which is really impor-

tant-spina bifida.

Spina Bifda.—This is a malformation of the vertebral canal with a protrusion of some part of its contents in the form of a fluid tumor. The tumor is relatic, compressible, usually increased by crying, and sometimes by pressure upon the anterior fontanel. The contained fluid is clear, resembling in all respects the cerebrospinal fluid. It is one of the most frequent congenital deformaties.

Spins hifids is due to an early failure in development—in most cases before the cord is segmentated from the epiblistic layer from which it is developed. Hence it remains adlacent to the epiblistic covering, and the structures which should be formed between the cord and the skin are undeveloped. For this reason there is in the wall of the sac a fusion of the elements of the cord, nerves, meninges, reristrated arches, nuncles, and integrament. If the error in development occurs later, the cord and nerves may be attached to the sac, but not intimately fused with it; in still other cases the



not enter the sac.

cord does not enter the use at all. The malformation may occur before the central canal is closed; or, if closed, it may reopen from the accumulation of fluid. It is probable that the accumulation of fluid first occurs, and that this prevents the union of the parts of the vertebral arches.

Although the tumor is generally associated with a bifid spine, this is not necessarily the case. The protrusion may take place through the intervertebral notch or foramen, or these may be a fissure of the bodies of the vertebrae, and an anterior tumor projecting into the cavity of the thorax, abdenies, or pelvis; the tumor may be so small as not to be recognized externally—spina hifida occulta. The principal anatomical varieties are meningoccle, meningumyelocele, and syringomyelocele.

Meninguests.—In this form there is a protrusion of the membranes only (Fig. 121). The accumulation of fluid is either in the arachnoid cavity or the subarachnoid space posterior to the cord. The opening of communication between the tumor and the spinal canal is small in this variety, smally being about one-twelfth to one-sixth of an inch in diameter. There may, however, be no communication. The skin is usually fully developed (Fig. 132). The tumor is frequently globular, sometimes pedimentated, and may attain a very large size, being as much as



Por. 122 — Minerconcern, 19 a Childi One Year One.

five or six inches in diameter. This is because spontaneous rupture is not likely to occur, and the lames does not become infected except by operative interference. With such tamors patients may live to adult life. This variety is most frequently seen in the cervical region. It has the best chance of natural recovery, and in it operation gives the best results.

Mesingsupplecele.—This is by far the most frequent variety of spina belida. It is the form usually seen in the sucrolumber region. The accumulation of fluid takes place in the anterior subarachnoid space, less frequently in the anterior arachnoid excity (Fig. 123). In this form the cord is contained in the sac, and usually forms a part of

its wall. The tumor is smaller than the meningocele, the usual size being that of a mandarin stunge. It is sessile, never pedimendated. As a mic it is only partly covered by skin, but has a central area, neually elliptical

in shape, where there is only a thin, translucent membrane. This surface, which is known as the central cicatrix, is sometimes covered with granulations, and frequently obserates. The tumor often has a sertical furrow or a central umbilication, corresponding to the attachment of the cord on its inner surface. The usual relation of the parts is for the cord to run konzontally across the upper part of the tumor to the central cicatrix, with which it becomes blended, and



Fig. 123.—Meantocompanents (partially diagrammatic). A, the membranes, B, the cord; C, the integration. The assumplation of fluid is in front of the cord, the fluments of which are opend not, forming a part of the wall of the loar.

from which again the nerves arise. These re-enter the canal at the lower part of the tumor, and are distributed below as usual. In other cases the cord joins the wall of the suc seen after its entrance, and its attenuated fibers are found spread out all over the sac, coming together again below and entering the spinal canal.

The following case, upon which an autopsy was unde, is a good example of the common variety: The child filed on the third day after birth from rupture of the sac. The tumer occupied the sacral region. The lirst sacral vertebra was normal, and beneath this the cord passed out of the spinal canal, terminating in the cauda equina seen after extering the sac, and continued back to the central cicatrix. Here nerve filaments blended with the other tissues in an indefinite structure, from which again, with tolerable distinctness, the nerve structures could be seen to pass over the wall of the sac and return to the canal. The afferent and efferent nerves and the part of the membranes they carried with them formed several septa, making a smaller separate sac within the larger one. The large sac was clearly a dilatation of the anterior subarach-roots space, and communicated freely with the same space in the cord above.

Springemyelocele.—In this variety the occumulation of fluid is in the central small of the cord, the lining of the san being here the atternated and atrophied used elements. This is the rarest form of tumor, but the one most frequently associated with hydrocephalus, and consequently has the worst prognosis. It may be found in the dorsal or development region as well as in the lumbouseral.

With spins billed other deformities are frequently associated, the most remove being club-foot, hydrocephalus, more rarely encephalo-cele or cerebral meningosele, and hare-lip. If hydrocephalus exists, there is in most cases a dilutation of the central canal of the cord and a direct communication between the tumor and the lateral tentricles of the train. Pressure upon the anterior fontanel causes an increase in the size of the tumor, and conversely. Club-foot is usually double, most frequently talipes equinovarus. In a number of cases there is a history of some deformity in other members of the family. We have seen two-successive children in the same family with spins bifids.

Symptoms.—The tumor in spins bifids is present at birth, and is most frequently lumboscend. Paralysis is frequent in myelocele and syringomyelocele, but is not seen in meningocele; its degree and its location depend upon the situation of the tumor and the extent to which the cord is involved. It is rare in cervical tumors, and most marked in those situated in the lumboscenal region. In the weest cases there is complete paraplegia, with paralysis of the bladder and recium. If the tumor is sucrolumbar or sacral, only the cauda equina is likely to be involved, and this but partially, so that the paralysis of the extremities is incomplete, and the bladder and rectum may swape. Spins hifids occults is in may instances the explanation of obsti-

nate incontinence of urine and immetimes of feces also. It may occur

nithout pamplegia.

In Fig. 124 is shown a very remarkable case of steral spins bifds in a boy of five years, who came under observation for inconlinence of foces. The tumor was a little more to the left than to the right side, and find been overbacked. It had evidently pressed upon the lower branches of the sacral plexus, so as to affect the sphincter and the glutcal muscles of the left side. The atrophy was very marked, as shown in the



Pro. 124 .- Sacratt Spring Berga.

The natural course of spins billed is to increase steadily in size; and if the tumor is revered by skin, its growth may be almost unlimited. It has been known to attain a circumference of twentytwo inches. If the integument is wanting, and the sac wall is very thin, rupture is pretty certain to take place, either spontaneously or by some accident, in the course of the first few mouths; usually death then results from convulsions owing to the rapid draining away of the cerebrospinal fluid, or from infection. In a large number of cases death is due to manumas dependent upon the most sisted conditions. Infection of the tumor may take place without

repture, the germs passing through the wall of the sac. If the opening communicating with the spinal canal is small, this infection may excite an inflammation limited to the wall of the sac, and result in a cure of the spina brida, usually with aloughing. We have seen such a case in a girl ten years old in whem this occurred in inflancy. The site of the former tumor was marked by a large dense cicatrix, and there still remained partial paralysis of the legs. If the opening into the spinal canal is large, inflammation of the sac is usually followed by spinal meningsits, which may extend upward and involve also the meninges of the brain.

Progressis.—This depends chiefly upon the anatomical variety and the existence of complications. Simple meningscale, when covered by integrment, gives the best prognosis, and complete recovery may occur. In meningemyeloude, especially if complete paralysis exists, the prognosis is lad; and if there is also hydrocephalus, the case is hopeless. In many cases in which rure of the spina bilida has followed operation, hydrocephalus has subsequently developed. Of fifty-seven cases reported by Demme, twenty-five were operated upon, with seven recoveries and fifteen deaths, while three were unimproved; of the thirty-two cases not operated upon, twenty-eight died within the first month, and not one lived over two years—the causes of death being managemen, rupture of the sac, and maningities.

Dispussion—It is usually may to recognize spina bilida, but it is often difficult to distinguish between the different varieties. The absence of a palpable figure in the spine, perfect translacency, and a polymeulated tumor, all point strongly to meningueste. Paralysis of the sphineters and lower extremities, ambilication of the senter of the tumor, a sessile tumor, a palpable bony fissure, and a large central cicatrix, point to meningomyelocels. The coexistence of hydrocephalus points to syringo-tayelocels.

Treatment.—In all cases the tumor should be protected from pressure, and when it is not covered by integument, care taken that the surface is kept absolutely clean and aceptic. It should be excered with some antiseptic powder and surrounded by a large pad of absorbent cotton, or a rubber ring-cashion. Complete paraplegia with incolvement of the bladder and rectum, hydrocephalus, or extreme marasmus—all contraindicate operative interference. If these are absent, operation should be considered. The time of operation will depend somewhat upon the nature of the tumor. If it is covered by integrment and grawing slowly, it is well to wait until the child is at least six months old. In other cases delay is dangerous, because of the hability to spontaneous or accidental rupture.

The treatment by injection has now been entirely supercoded by the operation of excision of the sac. For a description of this and the various plastic operations that have been proposed in connection with it the reader is referred to works upon operative surgery. In operating, it should not be forgotten that in the great proportion of the cases (nine-ty-five per ocut, according to the London Clinical Society's Report, which, however, refers only to fatal cases) some part of the cord is in the sac. The cord is often present in tumors situated below the third lumbar vertebra, swing to its attachment to the sac.

Although recovery may follow operation, in a very large number of cases it is incomplete; some degree of paralysis, with atrophy, contractures and deformities, remaining because of the implication of cord elements in the sac. In a considerable proportion of cases, hydrocephalus subsequently develops, as after similar operations upon corobral meningocele.

SPINAL MENINGTUS

In acute meningitis usually only the pin mater is involted. This rarely occurs alone, unless it is due to transmation. It is most frequently associated with inflammation of the pin of the brain, and may occur either with the meningococcus or the tuberculous variety. A certain amount of acute inflammation of the pin mater accompanies most of the rases of acute myelitis.

Chronic spinal meningitis in children usually involves the dura only. Inflammation of the external layer (external purhymeningitis) is usually secondary to carries of the vertebras. This is considered in the article on Compression-Myelitis.

Symptoms.—The symptoms of inflammation of the spinal membranes, no matter with wint pathological condition it may be associated, are due to irritation of, or pressure upon, the cord or nerve roots. These which are most common are: pain in the back, which is increased by mescategit, and usually by pressure upon the spinous processes; radiating pains following the course of the spinal nerves, felt in the extremities or in the trunk; rapidity of the spinal column due to spasm of the spinal unuscles, or rigidity of the muscles of the extremities; and hyperesthesia along the spine, which may be quite acute. When pressure upon the cord is added, there is paralysis or purests, sometimes muscular atrophy and anesthesia. Any of the above symptoms may be acute or chronic, according to the nature of the primary disease.

The diagnosis between spinal meningitis and myelitis is often not easy, for except in acute cases the two processes are usually associated; and in a given case it may be difficult to decide whether the boson of the cord or of the membranes is the more important one. In meningitis, pain, tenderness, squara, and irritative symptoms are generally more prominent, while lass of power and anosthesia are usually partial. In myelitis the pain, tenderness, and other irritative symptoms are less marked, while paralysis and anosthesia may be complete.

Treatment.—This relates first to the disease with which it is associated; in addition, counter-critation by means of the Paquelin cantery, rest in bed, and in severe cases even immedilization of the spine by a mechanical support. Total of potassium is often useful.

MYELITIS

Myelitis is a rare discase in children, with the exception of two varioties which are discussed under separate heads, viz., compression-myelitis and neute poliomyelitis. Otherwise myelitis usually results from injury, but it may occur as a complication of any of the neute infectious discuses, especially typhoid, scarlet fever, and diphtheria, and even as a primary discuse, when it is attributed to exposure or cold, but when it is probably of infectious origin. We have seen it follow varicells. Curvoic myelitis may be due to bereditary syphilis.

Myelitis usually occurs in children over ten years of age. In situation, it may be transverse, diffuse, or disseminated; the process may be acute, subsente, or chronic. The lexions and the symptoms are essen-

tially the same as when the disease occurs in the adult.

Symptoms.—Myelitis usually comes on rather gradually, with only leval symptoms; but the onset may be quite acute, with several general symptoms—fever, pain, prestration, and localized or general controlsions. The local symptoms vary with the sent and the extent of the disease.

In transverse myelitis loss of power and anosthesis are present below the level of the lesson; either of these may be partial or complete. At the level of the lesson there is a zero of hyperesthesia and "girdle-pains." All the reflexes below the seat of the lesion are exaggrated. Those at the level of the lesion are lest. There may be loss of control of the aphineters, bed-seems, degenerative changes in the paralyzed muscles, contractures, and vasomotor disturbances. The paralyzed muscles may be rigid or flaccid, according to the seat and extent of the lesion.

When transverse myelitis is situated in the cervical region there is paralysis and anesthesia of the arms, legs, and trunk. All the reflexes are exaggerated, and there is general rigidity of the paralyzed muscles. There is incontinence of feces and retention of urine, followed by incontinence from overflow. The pupils are frequently contracted, and there may be optic neuritis. Atrophy, when present, usually affects the muscles of the arms, and indirates that the cord to a considerable extent is involved. There is great danger to life, owing to paralysis of the muscles of respiration.

When the seat of disease is the derail region, the symptoms are similar to those above described, with the exception that the arms escape, and that the ocular symptoms are usually wanting. This is the most lavorable seat of the disease.

When the discuss is situated in the lumbar region, in addition to paraplegia and anesthesia of the legs, there is, from the beginning, insontinence of urine and feves. The knee reflexes are lost; the muscles atrophy, and usually give the reaction of degeneration. Bed-sores are frequent.

In diffuse myelitis the symptoms are a combination of the above groups. If a large part of the cord is involved, there are general paralyes and anosthosia, loss of reflexes, marked trophic disturbances, bedsores, etc.

The rounse of myelitis is slow, and it usually progresses steadily from bast to worse. Death is due to rabaustion or complications—cystitis, bedsorce, or hypostatic postuments—or to some intercurrent disease. In a small proportion of the cases there may be partial recovery, but very rarely is recovery complete. The diagnosis is to be made from spinal maningsitis, tumors, and bemorrhage.

Treatment.—The treatment of the early stage consists in the use of ice to the spine, or counter-arritation by means of dry staps or mustard. Later, the isolid of potasseum should be given in full desce; improvement may follow its one, even when there is no empirion of apphilise. Electricity is contramilitated except in chronic cases, and then but little improvement is likely to result from its use. In these patients the most important thing is careful attention to cleanliness and to posture, in order to prevent bed-sores, cystitis, and procumous.

COMPRESSION MYELITIS

(Pressure-paralysis of the Speed Cord; Pott's Paraplegia).

Compression-modifies is sometimes transmatic, but usually follows carries of the spine. It most frequently complicates this disease when the cervical or upper dorsal vertebras are involved, rarely when the lower half of the spinal column is affected. This difference is probably due to the smaller size of the spinal canal in its upper portion. According to Gibrey, paraplegia is seen in fifty per cent of the cases of carries of the upper half of the spine. Essentially the same condition, so far as the cord is concerned, may result from tamers of the spinal cerd, or from anything observationary pachymeningities. These, however, are exceedingly rare in childhood.

Lesions.—In spinal caries there occurs as a result of taberculous disease a softening of the bodies of the vertebrae, which fall together from the pressure due to the superincumbent weight of the body. This causes a backward projection known as the hyphosis, or angular deformity. The spinal canal is encreached upon by the remains of the vertebral bodies whose ligamentous attachments have been lossened, and also by inflammatory products, the result of periostitis, and localized inflammation of the dura mater, chiefly of the external layer, but which sometimes affects the internal layer also. All these conditions lend to the production of a mass of inflammatory material, often containing tuberculous deposits, which is chiefly in front of the cord, but may surround it. The compresssion takes place slowly in most of the cases, from the gradual progress of the festons mentioned. In a small number of cases there may be a sudden pressure from the slapping backward of one of the vertebral lookes.

In recent cases the cord at the seat of compression is a little smaller than normal. It is usually involved to the extent of from half an inch to two inches. Paraplegia may have existed when the changes found in the cord are very slight, and sometimes when no changes are visible to the naked eye. In more protracted and more severe cases, the cord is much smaller at the print of disease, and under the microscope shows the changes of interstitial myelitis (Gowers) with meningitis. In old cases there is degeneration of the nerve elements, atrophy, and sometimes disappearance of the ganglion cells, with more or less destruction. of the nerve filers; sometimes all distinction between the gray and white substance is lost. In addition to these marked changes at the point of pressure, there may be ascending or descending degeneration, as from other foral lesions. There is usually inflammation of the nerve roots. which have also suffered compression. It is in many cases surprising to see to what degree the cord may be compressed and still preserve its functions.

Symptoms.—In caries of the cervical region the symptoms of compression-sayehite not infrequently precede the deformity, and, in fact, the other objective symptoms of hone disease. The earliest symptoms of caries nenally arise from irritation of the nerve roots, and sonsist of gente pains often not referred to the spine, but radiating to the different regions to which these nerves are distributed. They are felt in the neck, in the cheet, in the epigastrium, and sometimes in the lains. Accompenying these pains, there is noticed a gradual weakness in the lower extremities, and sometimes also in the arms, according to the location of the disease. This may stepfull increase for several weeks until there is complete paralysis. Other symptoms are then commonly present. There is usually some degree of anosthesia, and there may be numbered. tingling, formication, and pain. The sphincters are not often involved. When the disease is in the upper half of the cord, there is rigidity of the extremities and great exaggeration of all the reflexes, with marked ankle-cloms. In the care cases in which the lumbar calargement is involved, there may be loss of reflexes, paralysis of the sphineters, and hedsories.

The distribution of the paralysis will depend upon the point of compression. If this is in the cervical region, all four extremities will be paralyzed; if in the dereal region, only the begs. According to the extent of the secondary besiens in the cord, there may occur muscular strophy and contractures. With disease in the upper cervical region, death may result from sudden pressure upon the cord, swing to a dislocation of the edenteid process; or there may be comiting, pupillary symptoms, irritation of the phrenic nerve causing biocough, or pressure causing paral-

ysis of the diaphragm.

Course and Prognosis.—These depend much upon the treatment of the case. In many cases of paralysis occurring early in carses, complete recovery takes place in the course of a few weeks, sometimes in a few days, after the application of a proper mechanical support. In the cases which have been long neglected, or these in which the paralysis developwhile proper mechanical treatment is being carried out, the chances are not so good. Gibney gives the following statistics of 153 cases under his personal observation: 31 proved fatal; 9 dying from myelitis, 14 from other discusses subsequent to recovery from the paralysis, and 6 from tuberculosis before complete recovery; 74 recovered from the paraplegia; 27 were recorded as improved or still under treatment. Belapses securred in about lifteen per cent of the cases. The usual duration of the paralysis is from three months to two years. Recovery has often taken place in cases that have persisted for four or five years.

Diagnosis.—This is rarely difficult. Spinul caries should be suspected in every case when the symptoms point to transverse myelitis

coming on without definite cause.

Treatment.—The indications are the removal of pressure and the fixation of the spine by a proper mechanical support. From his vary extensive experience, Gibney has more confidence in the iodid of potassum than in all else except mechanical treatment. Large doses are required, often from sixty to ninety grains being given daily for months. The iodid should always be targely diluted. Patients should be kept scrupulously clean, and the position changed frequently to prevent the formation of bed-sores. Electricity is contraindicated. When the paralysis decelops rapidly or occurs suddenly, relief may sometime be obtained by the operation of laminectomy; but little is to be expected from this in the slow cases.

ACUTE POLIOMVELITIS

(Epidemie Polismyrlitis; Acute Infuntile Paralysis)

There are few diseases regarding which for knowledge has increased so rapidly during recent years as acute poliomyelitis. The first great step in advance was made by Landsteiner and Popper, who, in the sumaier of 1909, succeeded in producing the disease in a monkey by intraperitoneal inoculation with the spinal cord of a patient dying of acute poliomyelitis. They were not successful in carrying the transmission further. Shortly after this Flexner and Lewis, using the intracranial method of inoculation, had no difficulty in reproducing the disease and transmitting it through an indefinite series of menkeys. No other animal seems to be susceptible. These observations, now many times repeated, have not only definitely established the infectious character of poliomyelitis, but have cleared up many doubtful points in its pathology.

Arute pollomyelitis is now regarded as a communicable, infectious disease which prevails both epidemically and sporadically. Although possibly its most characteristic lesions are in the anterior horns of the cord, any part of the central nervous system may be affected. The changes in the cond-substance are preceded by lenous of the meninges. Although the name policemyelitis is still retained, the scope of the term has been greatly widened.

This disease is characterized by an acute onset, with fever and usually other marked constitutional and nervous symptoms, from which there may be rapid recovery; but generally there follows early and extensive loss of power. After this there is usually seen a gradual improvement, and sometimes complete recovery. More often, however, there is left some permanent paralysis in certain groups of muscles, which undergo rapid and marked atrophy. Formerly, poliomyclitis was seen chiefly as a specially disease; but since the year 1905 epidemics have occurred with increasing frequency in various parts of the world, and especially in the United States since 1907. As it is most frequently seen in very young children, and as it is altogether the most common form of paralysis at this period, the old term "acute infantile paralysis" is perhaps the most appropriate clinical designation.

Etislogy.—Fully eighty per cent of the cases are seen in the first four years of life, the greatest incidence being in the second year. No age is exempt and in some epidemics the proportion of adult cases is quite large. Epidemics thus far observed have invariably occurred in the warm menths; those in the United States, from July to October. Fully four-fifths of the sporadic cases also are seen during these same months.

The prevalence of poliomyelitis in an epidemic form began with the outbreaks in Sweden and Norway in 1905 and 1906. These were followed in 1907 by the epidemic occurring in New York City and vicinity in which there were observed nearly 3,000 cases. After that poliomyelitis gradually spread over the country, epidemics occurring during the next four years in nearly all parts of the United States, Large outbreaks were also reported in other parts of the world. The most extensive epidemic known was that of New York in 1916 in which over 4,000 cases were reported in a single month.

The simultaneous or successive occurrence of several cases in the same

family has long suggested that the disease was deportly communicable. This has now been established by experimental evidence and is corrolorated by clinical observations. The disease may be communicated: (1) by the typical acute paralytic cases; (2) by mold, ambulant or abortive cases; (3) by healthy carriers, i. e., persons who have been in elste contact with one suffering from an acute attack; (4) by chronic carriers or those who have recovered from acute attacks. How long persons of the last two groups may convey the disease is not known. The virus has, however, been demonstrated on the mucous membranes of the mouth and nose after several months have passed. The disease, in most circumstances, is firely contagious, and only a small proportion of those exposed contract it. As in the case of cyrelrospinal meningitis, it is much more contagious when prevailing epidemically. The transmission by healthy carriers, though very exceptional, is undoubtedly the explanation of the occurrence of some of the widely separated cases seen in a community; others of obscure origin may be traced to abortice cases. That the virus of policinvelitie is carried by insects has not hern established. At present we know of no other way of acquiring the disease than by contact with affected persons or with those who serve as carriers.

The period of incubation of the experimental disease in monloys varies from four to thirty-three days, the average being nine or ten days. In man, also, it is variable, but in most instances the second case

in a family has followed the first one within ten days.

The specific organism of this disease belongs to the class of filtrable viruses. It passes through the pures of the finest porcelain filter. It has been isolated and cultivated outside the nody by Flexner and Noguchi, and with a high-power microscope it can be seen as very minute globular bodies. It is present in largest quantity in the diseased nerve structures, particularly the spinal cord. In the earliest stages of the attack it is also found in the cerebrospinal fluid, but disappears at about the time paralysis occurs. It exists to some extent in other tissues of the body, particularly the lymph nodes. The disease can be transmitted to animals regularly and with certainty only by insculation with an affected spinal cord, in which the virus persists for months after the scute attack. Experiments and clinical evidence indicate that the usual path of entrance is the meal muccus membrane. Osgood and Lucas have shown that the virus persisted in the nasal micross membrane of monkeys, in one instance for five months, in another for one and a half months, after the scute attack; which suggests that this may not only be an avenue of cutrance, but possibly a mode of elimination of the infection, and indicates that the duration of the infective period may at times he a very long one.

Lesions .- As a result of the investigations, particularly of Flesner

and Lewis upon animals, and those of Harbitz and School, Strauss, and others upon the disease in man, the pathology of acute poliomyelitis is now well known. This knowledge has greatly abled our clinical understanding of the disease.

The lesions found in this disease show in the cases severe enough to be fatal the effects of a widespread generalized infection. Not only are the persons tissues involved, but also the parenchymatous organs and lymphoid structures. In the nervous system the virus first attacks the meninges, especially of the cord and nedulla, setting up a rellular infammation of the pig, which becomes infiltrated with small, round cells. These changes are most marked about the blood-vessels. Resides this the walls of the vessels themselves are infiltrated and their lumen narrowed. The lesion also affects the ressels entering the nerve structures. As a result of the vascular bosions anemia, oslema, and hemorrhages are present, constimes small and rireumscribed, semetimes quite diffuse and extensive. Thrombosis addom accurs. But more important still are the secondary degenerative changes in the nerve cells, the site and extent of which are determined by the vessels involved and the intensity of the changes in them. The lesions in the pons, medulla, and cerebrum, like those in the cord, are secondary to the vascular lesions.

The transient paralysis in cases that recover may be due to edema of to lemporary vascular electruction from pressure entside the vessels ransing a local anemia. Permanent paralesis depends upon severs degeneration and actual destruction of ganglion cells; its extent, therefore, will sary with the number of the ganglion cells affected. Any part of the central nervous system may be affected, and the lesions are generally more extensive than the comptons would lead one to expect. The gross appearances give but little also of their severity. The process often involves nearly the whole length of the cord, being, however, generally most marked in the certical and lumbar enlargements. The changes are chiefly in the gray matter of the anterior home, and consist in acute degeneration of ganglion cells, usually marked and extensive. These cells in certain parts may disappear altogether, being replaced by lencocytes. The entire cord, however, may be involved. There is seen, but to a much less degree, infiltration with small round cells of the posterior horns, the columns of Clarke, and the white matter of the cord, everywhere closely related to the blood-vessels. There are regularly found changes in the spinal ganglia of a similar character to those described in the cord.

Lesions like those of the cord, though generally less marked, are seen in the pons, the medulla, the cerebellum, and even in the cerebral bemispheres. They are, as in the cord, especially related to the pin and the blood-ressels. There is seen acute destruction of ganglion cells and areas of cell infiltration with lymphorytes. The changes are especially marked about the nuclei of the cranial nerves, and in the gray matter about the fourth centricle. In some cases the bessel ganglia are also involved. Areas of infiltration, sometimes quite diffuse, may be seen in the cortex, with also some alight degeneration of panglian cells.

Thus, in the severe and fatal cases there is present a diffuse inflammation of the entire cord and its membranes, also of the medulla, pons, and basal gauglis, with less marked changes in the corebrum, always accompanied by changes in the pia. In the miller cases it is probable that the inflammatory changes are limited to the cord, though in some patients dying later from other causes Harbitz and School discussed changes in the upper centers, though no symptoms pointing to them had been present. From this account of the lesions it would appear that we can no longer distinguish between the legions of neutr policmyelitis, acute bullur paralesis and acute policacephalitis inferior. They represent varying phases of one and the same disease. In recent acute cases no changes are usually found in the nerves except degeneration of bundles, corresponding to the degenerated areas in the cord, and probably secondary to them. Lesions in other organs are often present, the most frequent being bronchopneumonia and acute parenchymatous degeneration of the liver and kidneys, similar to what is seen in other severe general infections. The thymns, the solitary follocles of the intestine, and the mesenteric glands may be much swallen.

In autopoies made upon cases of long standing the affected part of the tord, which is often only one lateral half, is smaller than normal. The general charges are those of a sclerotic character. The ganglien cells of the affected anterior born have either disappeared altogether, or they are few in number and so shrunken as to be hardly recognizable. The white matter also is smaller than in the sound part of the ord. The anterior nerve roots are degenerated quite to the muscles. The affected muscles are atrophied, and in extreme cases there may be a complete disappearance of muscle fibers, their place being taken by altipose and fibrous tissue. In places where the lesion is less severe the fibers are small. The affected limb is shorter and the bones smaller than upon the sound side.

Symptoms.—Cases of acute poliomyelitis present a wide variety of clinical symptoms depending upon the virulence of the infection, the age of the person attacked, but principally upon the part of the nervous system chiefly involved in the pathological process. They may be broadly divided into four general groups: (1) the cerebral cases; (2) the spinal; (3) the bulbospinal; (4) the non-paralytic or so-called abortive cases.

The Cerebral Type.-It is only very recently that scute poliencepha-

litis, fully described by Strümpell in 1885, has been regarded as a manifestation of this disease. Although some experimental evidence is still wanting, the identity of the histological changes and its association with acute policinyslitis in epidemics leave little doubt that acute policicephalists is often only the constead form of acute policinyelitis. Such cases are not to be confounded with the common forms of acute policinyelitis with receival symptoms.

The onset is generally abrupt, with convulsions which are often repeated over a period of a day or two. There is usually remitting and fever, which may be high. The paralysis which follows after one to three days of general symptoms is usually of the hemiplegic type, the face, arm and leg being involved. The reflexes are increased and the paralysis is of the spastic type. The face improves and usually recovers completely; the leg, next; while the arm is generally most affected and the paralysis is likely to be permanent and be followed by contractures. In its late results it resembles other forms of scute cerebral paralysis in early life.

The Spinal Type.-This group includes the most characteristic form of the duease and is numerically the largest. In the cases of moderate severity, the onset is alread and the symptoms may differ little from those seen in other acute infectious. There is usually vemiting, which is not repeated, more frequently constipation than diarrhea, and fever which is generally not over 103° F. Drowsiness, irritability, headache and prostration are seen in most cases. After the first day more definite symptoms, indicating involvement of the nervous system, are presentgeneral hyperesthesia, shooting pains in the legs, stiffness of the neck or extremities, pain on mation, etc. The blood shows a moderate polymerphonoclear leurocytosis and the cerebropinal field is generally clear, but may be slightly equiescent. It shows a greatly increased number of cells, which at first may be chiefly polymorphonuclear, but very soon are nearly all lymphocytes. There is an increase of globulin. After the febrile symptoms have lasted for from twenty-four hours to three days, the paralysis is seen. Exceptionally, the early stage is very short, and the paralysis is noticed almost at the muct. In the lighter cases, the fever may not be over 100° or 101° F., and may last only a day, with all the general and local symptoms correspondingly mild, though the resulting paralysis may be extensive.

In the paralytic stage the loss of power semetimes comes on quickly in a few hours; but more often, rather gradually, and extends for from two to three days before it is fully developed. The other pervous symptoms usually continue. The posture is in most cases dersal, with limbs semi-flexed, but in some cases with marked meningeal irritation there may be a general flexion of the body with opisthotomus, exactly as in rerebrospinal meningitis. The same rigidity of the neck and extremities may also be even. The knew jerks are not uniform, at first may be increased, but are seen lost on the paralyzed side and semetimes also on the sound side. Pain is present on motion, on pressure over nerve trunks and semetimes complained of when the patient is quiet. Retention of urine may be so complete as to require the use of the catheter, but in most cases the child is able to told, however, with considerable difficulty. The howels in most of the cases are constipated. The mind is usually clear, though the child is very sensitive to handling, and there may be general hyperesthesis. The duration of the fever is on the average three or four days; it is rare for it to continue longer than a week. The temperature range is generally between 101° and 103°, and the full to normal is gradual. Usually the height of the temperature is in proportion to the severity of the infection, but it does not necessare the danger of the attack, which depends rather upon what part of the nervous eastern is involved most seriously.

The description above given is that of the type most frequently met with, but many other forms of the disease are seen which add much to the difficulty of diagnosis. Certain cases present marked cerebral symptoms, chiefly stupor, with very few spinal symptoms. After the usual omet, the drowsiness soon develops into deep stupor, which may hast fer a week or more. These symptoms, with the continuance of the fever, the stiffness of the neck and irregularity of the knee jerks, form a picture which is almost indistinguishable from tuberculous meningitis. These cases belong to quite a different group from those described above as the credital type. The paralysis, when it secure, indicates an involvement of the cord at a high level and affects, besides other parts, one or both arms. Though the symptoms in such cases are most disturbing, the cerebral condition often clears up rapidly and completely.

Other types which may be seen in epidemics are: (1) those in which the symptoms of namingcal irritation are repecially marked, extreme muscular and nervous irritability, hyperesthesis, rigidity, etc., a group of symptoms strongly suggesting cerebrospinal meningitis; (2) cases in which, with many of the above symptoms, pain is especially prominent; (3) cases in which gastro-intestinal symptoms are particularly marked; both vomiting and diarrhea may last for several days and their prominence may obscure the nervous symptoms.

The Bultooptical Type.—The conset and general symptoms differ in no way from the severe cases of the spinal type. It is only after paralysis develops that the characteristic symptoms are seen. This group forms, according to Wickman, about 6 per cent of the epidemic cases. The bulous of the bulb are generally more extensive than one would expect from the symptoms. The symptoms of bulbar paralysis are nearly always limited to one alike whether they occur alone or with paralysis of the arms and legs. Almost any of the cranial nerves may be involved, altogether the most frequent being the facial. The whole nerve is not always affected. The facial paralysis is usually transient, but may be permanent. Order paralyses are next in frequency, the external rectus being oftenest affected. Disturbances of speech are not infrequent, but rarely persist. They are often associated with disturbances of deglutition, which, while not common, may be so severe as to necessitate feeding through a take. With these bullur symptoms are often associated others, indirating involvement of the upper part of the cord, such as paralysis of the disparages, the interestals, the neck, or the upper extremities. These cases form the most severe and fidal type of acute poliomyelitis net with, and it is the type that furnishes most of the deaths. The fatal result is nearly always from respiratory paralysis or broachespreumentia.

Acute bulbar paralysis with lesions limited to this part, though formerly described as a separate and distinct disease, is probably only a form of acute poliomyelitis.

Another rare elinical type is an acute according paralysis with symptoms described as Landry's disease. After the noral onset, paralysis affects first the legs, then the arms, the neck and finally the displaragm and intercestals, with death from respiratory paralysis. This extension of the paralysis usually occupies three or four days, though it is estretimes very rapid, and death may take place on the second or third day from the beginning of the attack.

Extent and Distribution of the Perulgio.-Wickman gives the following grouping of \$68 epidemic cases in 1965;

One or both legs.	NSS; one or both arms	75
Combinations of arms and legs	152; legs and trunk	35
Arms and trank	10; trusk sloss	9
Ascenting paralysis	22; descending president	22
Spinal and cranial nerves.	24; erminl terves alone	22
Whale body	23; not given	603

A comparison between this and 560 semalic cases we have collected from various authors is interesting:

One leg	229; both less	176
Combinations of arms and legs	42; one arm only	. 14
All extremities and trunk	79; all others.	10

In both series the large propertion of cases in which the legs are involved is striking; also the infrequency with which the arms alone are affected, and finally that in the epidemic cases there is a much larger number with wide-proof paralysis and with countal nerve involvement.

The latter, when occurring specialically, are generally classed under some other heading than neuto poliomyditis.

The paralysis, when limited to the log, most frequently affects the anterior titual group; next, the peroncal, and third, the quadriceps extensor femoris. The paralysis of the upper extremities most eften involves the shoulder group, the delicid being the muscle which usually suffers most severely. Paralysis of the sphineters is very rare, though bladder disturbances are quite common.

The most acrisss paralysis is that of the disphragm and the intercentals; either may be involved alone and the patient recover, but when both are affected death follows. Disphragmatic paralysis occurs when the lesion affects the third to the lifth convical segments of the cord. It selds no occurs early and may decelop quite late in the disease. Though this is always a serious symptom, it may last several days and yet recovery take place. When the disphragm is paralysed, all the accessory muscles of respiration are called into action; the respiration is wholly thouse and the abdominal wall, instead of protruding, is retracted on inspiration.

Paralpsis of the intercestals is rare, except in very severe cases, and is usually, but not invariably, fatal. It is seen in association with wide-spread paralysis of arms and legs, and in the rapelly spreading cases of ascending paralysis, and in the nest severe infectious. The respiration in intercestal paralysis is purely displaragnestic, which is not always may to recognize, as it is an exaggreration of the normal infantile type. When both intercestals and displaragns are involved, we see one of the most distressing conditions seen in the disease, i.e., death by respiratory paralysis. A remarkably vivid picture of this is given in the monograph of Poulody, Draper and Dochez. The mind is negally clear, alert and full of apprehension. Every health drawn is with severe effort. Sweating is produce. Cyanosis is usually absent. The struggle may last for several hours before death takes place. Although life may sometimes be prolonged for a considerable time by artificial respiration, there is practically as hope of recovery.

Paralysis of the abdominal muscles is not common, is usually of one side, but may affect both. It is evident by a great bulging or "ballooning" of part of the abdominal wall, in coughing, sneezing, or any forced expiration. It may remain as a permanent paralysis.

Coarse of the Discuss.—In those who survive the neste stage, there is a period of a few weeks' duration in which little change is seen. This is followed by spontaneous improvement, which neually begins in the number last affected, and reaches its limit in from three to six months. The jurisless remaining after this time is likely to be permanent. By

the end of six or sight weeks atrophy is present in the paralyzed muscles. The affected limb is distinctly smaller than its fellow, this being quite apparent even in infants. Except in the early stage, semony disturbances are absent; the knee-jerk is list in paraplegic cases, and in those in which the extensors of the thigh are paralyzed. There is arrested growth in the whole limb (Fig. 125). It becomes much smaller and shorter than its fellow. From paralysis of the shoulder and thoracic muscles various thest deformities may result (Fig. 126). The great

relaxation of the ligaments at the joints may allow sublination, especially at the knee and at the shoulder. The circulation in the affected limb is poor; it is often bise and cool.

Very early in the discase the strophisd museles begin to last their power to respected to farollism. In the muscular groups which are to be permanently purplysed, the faradic response may be lost in a week. The muscles in which recovery is to take place often preserve a certain degree of contractality. The response to the galvanic current may be increased for a



Fig. 125.—As One Com or Issuering Servar Panageare or the Extrar Laws Lowes Expensery, Showing extreme strophy of the thigh and log and a very characteristic deformity of the loot.

few months, and then slowly fail as the muscular fibers themselves degenerate, and finally it may disappear altogether. The reaction of degeneration is present in the atrophied muscles, but in them alone.

Non-Parelytic Cases.—The terms "abortive" or "ambulant" are sometimes used to designate cases of acute poliomyelitis in which all the usual early symptoms of the disease are present, yet which recover without definite paralysis having developed. In some of these cases there is, however, a general muscular weakness. These represent instances of infection in which the nervous system either escapes altogether, or is so slightly involved as to give no definite symptoms. That such cases exist there can be no doubt. It is believed by many writers that in number

they equal or possibly accord the paralytic cases. The evidence that they are genuine cases of acute potamyelitis is not only their frequent elimical association as epidemics with frank cases, but has now, according to Flexner, been definitely established by laboratory findings, viz.: (1) there are certain characteristic changes in the condesspinal fluid—increased number of cells chiefly lymphocytes and the presence of globulin; (2) there has been demonstrated in the blood neutralizing immunity principles, such as are found in persons suffering from typical attacks, but not present in normal blood; (3) the virus has been defected on the most and



Fig. 126—As the Case or Invarmic Serval Paralysis or the Lasy Asia and Speciage Muscles with Reservation Layeaux Converges.

baccal muscus membranes in such quantities as to make possible the communication of the disease to mankeys.

The recognition of non-paralytic cases of neutro policinyelitis has clarified many points in the spread of the disease. Policinyelitis may be suspected by the fact of the attack occurring in close association with other typical paralytic cases; but there is nothing diagnostic in the almiral symptoms; the absolute diagnosm rests upon the laboratory evidence above rited.

Diagnosis.—The recognition of acute polismy elitis before the occurrence of paralysis is impossible except by humbar paneture. If this is performed early, the coreleospinal fluid is found to be clear or slightly spalescent. The number of cells may be as many as 1,000 per c. mm-

At first these may be nearly all polymorphomadear; but soon they are replaced by lymphocytes, which generally form over 90 per cent of the cells seen. The test for globalin gives a positive reaction. By the time paralysis appears the cells have diminished greatly in number and soon the fluid may show no change by which it can be distinguished from the normal except an increased number of cells and an increased globalis reaction. The usual fluid found in scate poliomyelitis resembles that of inferentions maningitis, which some cases closely simulate in their clinical symptoms. The v. Pirquotaskin test is often a great aid in diagnosis; but in many instances one must wait two or three days for the course of the disease to declare itself, or until interels bacilli can be found in the cerebropous! fluid. Cooks with muscular pains, general hyperesthema, regislity and high lever may easily be confounded with cerebrospinal meningitis. It can be excluded only by lumbur paneture.

The later manifestations of the spinal type of polionychits are a flaceid type of paralysis with marked atrophy and characteristic electrical reactions, but without sensory symptoms. It may be conformed with multiple neuritis, or the pseudo-paralysis of rickets. Multiple neuritis is rare in children except after diphtheria, and is more gradual in its onset. The type of paralysis and the electrical reactions may be the same as in polionyclitis. Certain both palsies, resulting from injuries received during delivery, may resemble polionyclitis when the deltoid or shoulder group of muscles is involved. Without a char history a differential diagnosis may be impossible. The muscular weakness of rickets is general; there is no reaction of deponentian and no history of acute onset. Scurry is distinguished by the very scute hyperesthesis, by the swellings, and by temperatures from the gums or other mucous membranes together with a history of improper feeding. The child refuses to more his legs only because of pain. The credital form of polionyclitis gives a spactic paralysis, usually hemisplegic in type, which may be indistinguishable from other forms of acquired cerebral paralysis.

Prognous.—The dangers from potiomyclitis are twofold; that to life during the acute stage, and that to muscles in the form of permanent paralysis and disability. The mortality is much higher in epidemic than in speradic cases. The death rate in the various large epidemics has ranged between 10 and 20 per cent. The danger to life is least in miants and very young children. In cases terminating fatally death usually occurs between the fourth and seventh days of the disease. The cause of death is generally respiratory paralysis or broachopneumenia.

It is impossible to say in any case of advancing paralysis when it will be arrested. It mirely specials after the seconth day. An important question in prognosis is whether paralysis will be permanent or not. Wickman reports recovery from paralysis in 64 per cent of 550 epidemic cases. This is a larger proportion than most writers give, and much larger than we have considers observed. Complete recovery from paralysis in 40 to 35 per cent of the cases in much nearer the average result.

Significant symptoms in any given case are the amount of wasting and electrical reactions. Muscles which seen less completely their faradic contractility are almost vertain to waste rapidly and severely. The best indication of coming improvement is the return of faradic contractility. If this is completely last for six months, recovery is very doubtful; if faradic contractility is not lost, great and early improvement in the paralyced muscles may be confidently predicted. After six months but little spontaneous improvement is to be looked for, and after two years more at all.

Treatment.—The communicative character of the disease being now established, it follows that all cases of gente policosyclatic should be isolated) when the disease is spidemic this is imperative. It is not now known how long a given case may be infertions. A month's quarantine may be considered a minimum; but during epidemics a longer time should pass before an affected person should be allowed to mingle with other children. All discharges, especially those from the month and nose, should be disinferted and distroyed. Persons in contact with active cases should use some cleaning usual spray or month wash as the only means now known for preventing infection. The same elements and disinfection of apartments should be practiced as after other infections discuses.

Since we have as yet no specific remedy for poliomyelitis, the treatment during the acute stage a symptomatic and to be conducted along the same general lines as other acute infections. Hexamethylenamin (unstropin) has been extensively seed in this disease, in does of five to ten grains four times a day to a child of three or four years, but there is no convincing proof that any drugs are effective in aborting the disease or presenting or arresting paralysis. Absolute rest is essential, even in the mildest cases, and should be continued for an average period of two weeks; longer when irritative samptoms are protracted. Pains in the affected limbs during the acute stage may be lessened by the application of splints to insure immedilization and also at times by wrapping limbs in cotton. There should be as little handling as possible. It is important to support the limbs, so as to lessen the chances of deformity. There should be placed at the feet pads or sand-lugs, to prevent footdron, which otherwise is almost certain to occur in cases of anterior tibial paralysis. Severe pain may require the administration of morphia or rodom. Paralysis of respiration in the acute stage is practically beyond holp. Feeling through the take it sometimes necessary in bulbar rases for a considerable time, owing to paralysis of the muscles of deglatition.

When all acute symptoms have subsided, which is generally in three or four weeks measures should be begun for the development of the paralyzed muscles. The beneficial effects of electricity have been greatly overestimated. In many cases, increver, it is useful, but should never be above relied upon. Fundam may be used three times a week for such muscles as respond to it; for other muscles galtumism should be employed. The pain and terror which the use of electricity strike in most small children makes its continuince a practical impossibility. It is far beller under each circumstances to rolt on other measures.

Massage and passive movements may be begun as soon as hyperesthesis has gone, and may be used at first daily and soon twice a day to all affected parts. They should be continued for years. But still more important are active soluntary movements carried out by the patient himself, which should be developed with great care and systematically carried out for an indefinite period. It is really surprising what such measures when intelligently used can accomplish.

Mechanical Treatment.—Mechanical applicances are useful to prevent deformity, also to furnish support to the limb in order to enable the shild to walk. By such means many get about with tolerable coinfort for whom locomotion without apparatus is impossible except with crutches. To overcome existing deformities in neglected cases, braces are employed in conjunction with mystomy or tenstomy of the various shortened tendons, excision of portions of elongated tendons, and the production of artificial anchylosis in cases of "flail joints." By these means the orthopolic surgeon is able to give a great deal of relief to these unfortunate and sometimes helpless patients.

TUMORS OF THE SPINAL CORD

Tumors of the cord are exceedingly rare in risibleen and almost unknown in infancy. They spring from the bone, from the meninges, or from the cord itself. The most common meningeal tumors are surcomats, fibromata and lipomata, the last named being found in association with spina bifids. In the cord glicensts, surcomats, solitary inherdes and gammata may be encountered.

The first and most important symptom is pain. This may be in the extremities or in a girdle form around the body. Associated with the pain may be a zone of hyperesthesia. Eventually there may be anesthesia. Motor symptoms are manifested somer or later. There may be contractures or tonic spasm and finally spastic paralysis with exaggerated reflexes and ankle closus. The arms are sediem involved, Especially characteristic is the Brown Sequard paralysis—a unilateral paralysis with a zone of hyperesthesia upon the paralyzed side and with anesthesia upon the opposite side. Paralysis of the bladder and restum is present, but is not always an early symptom.

The diagnosis of tumor is to be made from these general symptoms, in the absence of injury or of caries of the spine, which is the most common cause of transverse lesions of the cord in childhood. The localization of the growth is to be made according to the rules of general neurology. This is difficult in childhood, because the tumors are apt to be diffuse (gliomata, successata, tuberculemata) and because of the frequent inability to obtain the necessary cooperation from the child. The general symptoms are also very uncertain. We have seen a fibroma of

the meanings in a fire-year-old child macconfully removed by operation, which caused no pain at any time.

The progness is bull. Few cord tumors in clatchood are of such a character or in such a situation that they can be removed. Unless they are malignant, or can be removed, that they can be removed. Unless they are malignant, or can be removed, that they can be removed discusse, from bed-sores or from according inflammation of the urinary tract. The treatment is surgical. If operative removal is impossible, nothing can be done except to make the patient comfortable.

HEREDITARY ATAXIA-FRIEDREICH'S ATAXIA

While cases of Friedreich's abasis are encountered with ne history of a like disease in relatives, the disease is especially likely to attack several numbers of a family in one or more generations. As many as eight sufferers from the disease in one generation have been reported, and it has been traced through three generations. Friedreich's ataxia is for this reason to be classed among the hereditary degenerative diseases of the nervous system. Except for this hereditary influence, there is no ethological factor known.

Friedreich's ataxia is an infrequent disease, remaining of two fairly distinct types. The type of interest to pediatrists occurs early in childbood, usually between the fourth and seventh year. The other type, often known as the Marie type, is solden found before the twentieth year and used not, therefore, concern as here.

The pathological changes are chiefly in the rord. These consist in a diminution in the riccumference of the cord throughout its entire extent and in a degeneration of various tracts, chiefly the posterior columns. The column of Goll is affected throughout, the column of Burdach to a greater or less degree, and the crossed pyramidal tract to a slight extent. In addition, the cells of Chirke's column are degenerated and there is a consequent degeneration of the direct cerebellar tract and the bundle of Gowers. There is no degeneration in the cells of the anterior horns.

Symptoms.—Attacks is the most striking and usually the earliest symptom. It is first noticeable and is always most marked in the legs. There is difficulty in walking and even in standing, but the ataxis of the legs is noticeable in any position, even when bying down. The children stand with their legs wide apart. In some instances there may be a distinct Homslerg symptom, it being impossible for them to stand at all with the eyes closed. The gait is ataxic, much like that of locamotor ataxis at first, but later it may be so disturbed that the patient reds from side to side as if intoxicated. Eventually beamotion is impossible percelly when the muscular tenkness, which is regularly present, becomes extreme with atrophy. Early in the disease nuneular weakness is slight. There may be welfaling of the head and there is usually a course fremor of the arms and hands. Sensation is well retained and control over the bladder and rectam is normal. Exceptionally there are sharp, lancinating pains in the legs. The knee jerks are commonly absent. Slow, transing, sometimes explosive speech is very frequent and late in the disease speech may be nearly impossible. There is often a marked nystigmes. A striking symptom is the common deformity of the fact. This may be one of the first symptoms to be noticed. The foot appears shortened, it is markedly arched and is held in a position of slight equine-varies. The good too is hyper-extended and sometimes the terminal phalanx is flexed. Kypho-scolinus decelops with the advent of muscular weakness. The intelligence is well retained for a time but suffers deterioration in the course of the disease. In the form described by Marie, there are often engagerated reflexes, optic nerve already and paralisis of the extra-ocular nuncles; but these symptoms are seen in children with the greatest infrequency.

The course of the disease is progressively downward, the ataxia becoming more marked and that and the muscular weakness make walking impossible. The patient eventually becomes bed-ridden, in a condition of dementia. But the progress of the disease is very slow. It may last twenty or thirty years or more. Death is usually due to some intercurrent disease and is rarely the receit of authenia. Predicted's ataxia is incurable. It can only be treated symptomatically.

DISEASES ASSOCIATED WITH PROGRESSIVE MUSCULAR WASTING.

A number of diseases in infancy and childhood are accompanied by muscular wasting. This may be secondary to disturbances of autrition, to some chronic infection or it may result from disease. Wasting is also present with organic diseases of the nercons system, particularly as the result of some acute lesion such as policonyelitis, and also with chronic crippling diseases such as spastic pumplegia, chronic maningitis, etc. But there is a group of diseases in infancy and childhood that as characterized chiefly by progressive muscular wasting with great weakness. They develop insidiously and with but few acceptions progress uninterruptedly to a fatal termination. They are of great chronicity and are practically incurable. Many show a marked hereditary tendency. Of these diseases, there are a number of more or less clear cut types that may be recognized climically and pathologically. There are, however, very many cases that pathologically, as well as clinically, have the characteristics of two or even more types. For this reason, it has been hard to classify these diseases. There has been much difference of spinion in regard to them and there are obvious objections to all methods of classification. The besiens in some of these cases are chiefly in the cord; in others, in the nerves, and, in the largest group, in the neuscles. We shall therefore group them as the spinal, the neural and the muscular forms.

Spinal Muscular Atrophy.—The spinal forms are unusual in shildhood. Chronic bulber paralysis and the Aran-Durffenne type of spinal atrophy are so rare at this age as to be of little importance to pediatrists. The other type of central strophy that his been described, though infre-

quently, is

The Werding-Hoffman Type.—This disease is markedly bereditary; several children in a family may be affected and the disease has been traced through two or three generations. It is not a common diseaseonly twenty or thirty cases in all have been reported. The onset is early, usually toward the end of the first year. A weakness in the thigleand back develops in a child that up to that time has been entirely normal. This weakness extends so us to involve the shoulders, the neck, and, eventually, the arms and thighs. The logs and lower arms are only involved late in the disease, and the hands and feet rarely at all. There is marked atrophy of the muscles, particularly those of the pelvis and choulders. The nurseles show at times fibrillary contractions and there is always loss of deep and generally of superficial reflexes. There is a great diminution in response to both faradic and galtanic currents. The mascles of the face usually escape entirely. Bulbar symptoms are very unusual. Speech is normal and the mentality remains unaffected to the end. There is no interference with sensation. The progress of the disease is quite rapid. Death usually results in two or three years, from respiratory involvement or from pnessmonta-The localization of the chief muscular purssis and alrepty in the polyic and shoulder girdles, the progressive character of the disease and the resention of a clear mentality, distinguish it from the other diseases with which it is likely to be confounded which are chiefly; amuntonia congenita, polismyelitis, progressive neural and muscular atrophy and ammurotic idiocy.

The pathological changes are clearly marked. There is an strophy of the spinal cord, with degeneration of the cells in the anterior horas throughout its whole extent from the medulla in the canda equina. Secondary to this is a degeneration of the anterior mots of the cord and of the motor serves, with great strophy of the innicles. There are no changes in the pyramidal tracts.

The progress of the disease is rapid. It is unbroken by periods of symission and the outlook is hopeless. No treatment has any effect.

Neural Muscular Atrophy.—The existence of a form of muscular atrophy dependent upon primary changes in the peripheral nerves is denied by many authors. We have retained such a classification for the reasons that in the permeal type of muscular atrophy there are frequently severe lesions in the nerves, that the type is generally clearly marked, and that the disease runs a much more benign course than any of the other forms of muscular atrophy.

Percoval Type. (Charcot, Marie, Tooth.)-This form of muscular atrophy exhibits as marked familial tendencies as any other known disease. Examples of it have been met with in five penerations and it is seldem confined to one member of a generation. Herringham has recorded a family in which 26 members had been afflicted with the disease. The onset is generally after the sixth year. It begins slowly and symmetrically in the distal sucts of the extremities, usually the legs. The extensor longus halloris and the extensor longus digitorum and the tiltialis anticus are usually the first muscles to waste; afterward the percural group. The benlimtion of the muscular weakness causes inability to flex the foot, which bangs down, causing an impediment to walking. To overcome the impediment the knees must be markedly flexed, which causes the "stepping" gait. Double club foot in the position of equino-varus, often recults from unapposed magular action and from attempts to walk. On this account many of the cases first come to the attention of orthopodic surgeons. It is uncommon for the disease to begin in the bands, but instances of such a mode of onset have been reported. The atrophy then affects the small muscles of the hands. As the disease progresses the legs and forearms gradually become involved but the thighs and upper arms remain free. There is no hypertrophy of muscles or pseudo-hypertrophy. There may or may not be fibrillary twitching of the muscles. Sensation may be normal or there may be complaint of puresthesia, or of feelings of heat and cold. Shooting pains may be felt but the pain is never very severe and is frequently entirely absent. Control of the bladder and rectum is complete. There is a diminution of response to the faradic and also galvante currents in the affected muscles and in vertain instances this may obtain in muscles which are apparently normal.

The course is an exceedingly slow one and usually not continuously progressive. In this regard it differs greatly from the allied conditions. There may be remissions of such length that cure may be said to have occurred. The discuss seldom results in death and many patients live an active, self-supporting life for years. A return of the affected parts to a normal condition it impossible even though complete arrest may take place.

The nerves in the presumal type of numeralar atrophy are almost

always the soat of a marked interstitial growth. Associated with the reural change is a degeneration of the posterior columns of the cord and a marked already of the moudes involved. Here, as in all those allied discuss, exceptions may be found in a preponderant alteration in the cord and massless and an almost complete escape of the nerves.

No known treatment arrests the prognosis of the disease. Electricity, massage and baths may assist in retaining muscular function. Orthopoint treatment (tenology, branes, etc.) is of marked aid in preserving the shilling to walk.

Muscular Dystrophies.—There are certain well established facts in regard to the muscular dystrophies. The changes are primarily in the muscles. They are not dependent upon bestens of the nerves or the cerd even though secondary degenerations may be present in those situations. While soluted cases are here and there encountered, muscular dystrophies are family discuses. They affect boys rather more often than girls. What it is that determines the progressive wasting of the muscles is quite unknown. It appears to be an informat weakness of the muscular system, an inshifty of the amorbie to carry on the light for existence. They fail to survive as various parts of the nervous system may fail.

The lecture of muscular dystrophy are essentially the same, no matter what the type. The individual muscle fibers waste. They become round instead of polygonal and eventually they deappear, leaving the sarcolemna sheath, with greath increased nuclei. Certain of the fibers may actually largertrophy to several times the size of the normal fiber. but this is only a temporary process. Energially the hypertrophic fibers. share in the general atrophy. Replacement of the muscle fibers by connective tissue occurs to the atrophy goes on, and coincident with the muscular atrophy a deposition of fat takes place in the muscle. This may largely compensate in amount for the atrophy of true muscular solstance so that the diminution in size of the whole muscle may be very gradual. This deposition of fat may even be excessive and thus the pseudo-hypertraphy is caused. Upon the relative amounts of the muscular fissus, esometive tissue and fat, depends the appearance of the muscles as a whole. They are lighter in color than normal, perhaps even yellow and selt. Eventually, the fat largely disappears and only firm, floors and contracted strands of connective tissue are left.

Psycholitypertrophic Panalysis.—This is the most frequent and best-known variety of the nuncular dystrophies. The symptoms as a rule some on early in childhead, nearly always before the tenth year, and generally between the second and soverall. The earlier symptoms rotate to a general weakness of the lower extremities, which is accompanied by a nearlest mercase in the size of certain mescular groupneually those of the calves, but sometimes more of the thighs or the gluteal regions. The colorgement may affect almost any nescenar group of the lower extremety. Children walk ansteadily, and fall very early. They have special difficulty in rising from the floor and in mounting stairs. The method of rising in well-advanced cases is quite character-

stir; the patient lifts his body until he tourbes the foor only with the hands and feet; then he proceeds to "climb up himself" by patting first one hand upon the knee, and then the other, gradually moving his hands higher and higher up the thighs until the erect position is attained. This is seen in many of the cases, but not in all.

Most of these patients exhibit, while standing, a murked degree of lumbar lordesis, due to the weakness of the extensors of the hip and later of the numeries of the luck. They stand with their shoulders far back. This is well shown in Fig. 127. The patient may be so weak upon his legs that the slightest touch will cause him to fall even with his apparently immense muscular development. The small muscles are generally weaker than these which are each larged.

With the progress of the disease, the massles of the arms and shoulders become involved. Some of these atrophy at once, others may exhibit pseudo-hypertrophy for a time. The infraspinutus is the most frequently calarged, next the supraspinatus and the deltoid. The pectorals and latissimus dorst are never cularged but are generally markedly wasted. The weakness of the shoulden nuiseles makes the characteristic diffi-



Fig. 127.—Minocolan Perricogyrearmorer. Showing to a modtrate degree the large onlyes and glatest regions with a marked legion. Group a photograph by De M. A. Surr.)

culty in picking the child up by grasping him under the arms. They slip through the hands. The rhumbools and the levator argulas supulas, the hiceps and the triceps gradually are involved, and later in the disease there is such marked strophy with corresponding reakness of all the affected groups that the patient may be smalle to walk or even stand, and is absolutely helpless with the exception of the use of his hands. The knee-jerk is at first normal, but gradually diminishes until it is finally lost. The electrical reactions are normal until marked wasting occurs, when there is a lessened response to taradism and galvanism, but mover the reaction of degeneration. There are no fibrillary contractions, and no sensory disturbances. The progress of the disease is generally slow, and smootimes irregular. It is often more rapid in early childhood, and slower after pisterty. Many of these children, though apparently bright, are distinctly below the average for their ages.

The prognoses is grave, most patients dying in from five to lenyears. Death seldom results from the disease itself, but rather from some intercurrent disease, repetially of the lungs. Nothing can be demto stay the course of minimized dystrophy. The diagnosis is generally easy from the apparent hypertrophy and actual weakness of the muscular

groups. The disease is incurable,

The Jurenile Form of Muscular Already (ReV's Type) .- This is much less frequent than the form just described and usually begins somewhat later in life, between the teath and extremth years. It is characterized by progressive scatting of certain minicular groups, especially those about the shoulders and peiris, and hypertrophy of other groups. Of the shoulder and upper extremity, the mustles affected are the pectorals, the trapenus, the latissimus dorsi, the serrati, the rhomboldet, the muscles of the upper arm and the subscapularis. The deltoid, infraspinatus and supraspinatus for a long time escape, and may be hypertrophied. The hand and forearm are not involved. In the lower extremity, the muscles of the pelvis, thighs, and glutcal regions are affected, while these of the leg and foot escape until late in the disease. Weakness and atrophy of the muscles of the back cause lorders of great severity. In this disease there are no fibrillary contractions, no reaction of degeneration, and no sensory disturbances. The course and result of this form are essentially the same as in the preceding variety. It is now regarded as the same disease pathologically, the only difference being that of localization. In the terminal stages differentiation may be impossible and mixed cases that demonstrate from the beginning the predominant characteristics of both types are encountered.

Landoury-Dejerine Type.—In this, wasting begins in the muscles of the face; the lips are thickened and weakened. They cannot be firmly closed, but all the rest of the facial muscles are markedly strophied, giving a peculiar expression to the mouth known as "the tapir arouth." Speech may be greatly interfered with but the muscles of mustication and deglutition are not affected. This serves to differentiate the disease from bulliar paralysis. Later, the atrophy extends to

the shoulders and arms, but does not involve the supraspinatus or infraspinatus, or the flexors of the hand and forearm. This type is sometimes described as beginning in the shoulders, or even in the legs. The description therefore corresponds to the juvenile form of Erb, with the addition of the facial symptoms, and it is undoubtedly a variety of the same disease.

CONGENITAL MYATONIA

(Congenital Ampitania-Oppositetu's Disease)

This disease was first described by Oppenheim in 1960. Its cause is unknown. The symptoms are usually noticed in the early menths, sometimes very soon after both. In some cases it has been observed even during pregnancy that fetal movements were less vigorous than usual. There is a general flaceld paralysis. That of the lower extremities is usually complete; but in the upper extremities feeble movements of hands or arms may be present. The intercostal nuncles and those of the neck are usually but not always involved. The disphragm and all the muscles applied by the cramial nerves escape. There is no scular or facial paralysis.

In the well-marked cases the child lies completely helpless and motionless; the knee jurks are alsent; but sensation is not affected and the mentality as normal. The electrical reactions are feeble or even may be absent. Owing to involvement of the intercostals the respiration is usually labored, panting and displaragmatic in character. Secretions accomulate in the pharyax and air passages and choking attacks often occur. These may result in fatal asphysia, or in aspiration presuments. The pulse is normal and regular. There are apparently no subjective symptoms. The infants are usually well nourished and may even be very fat. In those who live for several months or years the intelligence is apparently normal and control over the sphine-ters complete. Deformities of the chest are often produced as a consequence of the paralysis of the respiratory muscles.

Besides the marked form of the disease, to which the above description refers, it is now recognized that myalonia may occur in all degrees of severity. In the mild form there may be only very great weakness and atony of the muscles. The ability to bold up the head or to walk may then be greatly delayed though the intelligence may be quite normal. These cases are often confounded with rickets; but the weakness in injutonia is permanent. Owing to the greater involvement of some muscular groups, contractions of opposing groups may occur. This may lead to confusion with policomyelitis. The milder forms of myalonia

may be readily overlooked and may came but little interference with function. Between these and the secure forms of the discuss there are seen all degrees of muscular weakness.

The besiens are chiefly in the number, which show great strophy and degeneration. They may waste to fibrous conds or may largely be replaced by connective tions and fat. In several of the cases the cells of the autorior horns of the cord bare been found reduced in number, sometimes almost about, and the autorior nerve roots atrophic. The brain is normal. The nervous besiens are to be regarded as a failure of development rather than a degeneration. It is believed by some that they are the primary condition, the lack of muscular development being the result of deficient innervation.

Many of these infants suffering from this disease die in the first scar, most frequently from broachspacements to which they are espesially prelisposed by reason of the condition of the respiratory muscles. The duration of the mild forms of the disease is indefinite. We have seen a few older children and young adults with this form of the disease. In some cases a slight improvement has taken place; but no cures have been reported. The condition is not influenced by treatment. The discase usually either remains statistiary or very slowly progresses, the child dying of some intercurrent disease.

CHAPTER V.

DISEASES OF THE PERIPHERAL NERVES

MULTIPLE NEURITIS

Unrea the term multiple magritis are included those cases in which several nerves are involved in an inflammatory process, which may at times be general. In its distribution multiple nearitis is usually symmetrical, but it is not necessarily so.

Etiology.—The chief cause of multiple nearitis in children is diphtheria, although it is occasionally seen after other infectious diseases, especially undaria, typhoid or scatlet fover; measles, and mumps. In diphtheria the inflammation is due to the direct action of the torins upon the nerve structures, since it can be induced in animals by injecting toxins into the circulation. There is little doubt that in all infections diseases the inflammation is excited in a similar way. The metallic poisons, lead and arcenic, are rarely the cause of multiple neuritie in carry lefe, and the same is true of alcohol, although a marked case from this cause has come under our observation in a child only three years old. Lastly, there are cases in which the cause assigned is simply exposure to cold—those classed as cheumatic.

Lesians.—Almost any nerves in the body may be affected, although the distribution varies concentrat with the cause of the disease. The mineulo-spiral and the anterior tibial nerves are most frequently inrolved, but the inflammation may affect any of the sponal nerves, including the phrenic, and occusionally the cranial nerves, especially the presmognetic, hypogloscal, sculomotor, and abducens. Several nerves in different parts of the body are usually affected, the lesion being in most cases symmetrical.

The affected serve is sometimes red and swollen, owing to acute congestion and edens or to a sem-fibrinous standation. In other cases the changes are almost statistly degenerative. The interactors shows the changes semetimes to be chiefly interstitial and sometimes chiefly parenthymatous. There is an expetation of cells into the sheath, between the sheath and the nerve fibers, and even between the nerve fibers themselves. The myelin breaks up into granules, and in places may completely disappear. The late changes are those of subscute or chronic degeneration of the nerve fibers.

With these changes in the nerves there are associated, so some cases, inflammatory and degenerative changes in the ganglion cells of the spinal cord, although they are much less severe than are the busins in

This case was in many respects a remarkable one. The boy completely emptied a deceater containing twolve cances of whicky, but almost inmediately variated the greater part of it. He soon after showed the respices of ulcikolic intoxication, and in 4 few hours because complete, in which condition be contimed for twelve keers. After this he gradually lost power is his legs, and at the end of a week was spable to walk at all. He had convaluous, and after this there developed the neml symptoms of meningate at the conventy, with which he was admitted to the Babase Hospital, three weeks after disalong the whisky. The child was then unconscious and there was present incomplete paralysis, affeeting all four extreme as with anotherin of the arms. The netice inflammabury symptoms continued for six weeks longer, during which time there were repeated conviduous, portingous stoper, fover, grabully increasing deformation, marked atrophy, loss of reflexes, and great dimination in the faradic contractility. of all the paralyzed muscles; in the thighs, left leg, and abdownid muscles there were no responses to a strong current, but there was newhere the reaction of degeneration. The child was at desta's door for three or four weeks. Three morehe after the attack the first signs of improvement were observed in the cerebral symptoms. Shortly afterward he began to two his bands, and at the end of six weeks he was malking alone and talking freely. The improvement was very rapid, and outh weeks from the date of the first change for the better, and five morehs from the time of taking the whicky, he was so well as ever. The diagnosis was makiple alcoholic neurons, with a conveyory meningitis. (Fig. 128 is from a photograph rules while the symptoms were at their height.)

the nerves. However, they were once regarded as the explanation of some of these cases, particularly of diphtheritic parallels.

Symptoms.—The easet of multiple neurities is in most cases a gradual case, it being usually from two to four weeks before the paralysis reaches its beight. Very exceptionally the onset may be abrupt, with fever, and marked paralysis in a few days. It is characteristic of this disease that both nester and sensory symptoms are present, and that they are the same in their distribution. The symptoms are usually symmetrical. There is first noticed a general weakness in the affected mapels, which slowly increases to complete paralysis. As the extensor groups of the hands and feet are upt to be affected, there are wrist-drop and foot-drop (Fig. 128). The paralysis may begin in the feet and hands,



Pas. 128.—Accessize Naturns, services Connectantive: Discretes or non-Past. This position of the lower extremities was unintained for over a mouth. Boy three years old.

and gradually extend until it involves not only the four extremities, but even the muscles of the trunk and the neck, although this is rare. The child may then be absolutely helpless, unable to sit up, or even to support his head. In such cases the head seems loosely attached to the body, and rolls about on the shoulders like a ball. Weakness of the spiral muscles loads to deformities (Fig. 129) which may be mistaken for Pott's disease, even by experienced observers. In most of the muscular groups the paralysis is incomplete. The symptoms which relate to the phrenic and the cranial nerves will be described with Diphtheritic Paralysis, for they are rarely seen in any other form. It is characteristic of multiple neuritis that the bladder and rectum escape.

The sensory symptoms are marked only in the early stage of the disease, while the paralysis is increasing; they improve so much more rapidly than the motor symptoms, that they may be altogether wanting at the time that the paralysis is at its height. In some cases they are so slight as to be overlooked. There is usually pain along the course of the affected nerves, which is sharp and neuralgic in character, and generally associated with arute tenderness of the nerve trunks and of the muscles. Often there is a general hyperesthesia in the early part of the attack, followed by partial anesthesia. The sensations of touch, pain, temperature, and the nunecular sense are all about equally affected.

Ataxia is not uncommon, and may be a more striking symptom than the loss of power. All the reflexes are diminished ar lost, especially the knee-jerk, as the legs are usually most affected. Sometimes, particularly after diphtheria, there is loss of the knee-jerk, when there is no other symptom of nearitie. In the severe cases muscular fremor is fraquently present.

Atrophy is a prominent symptom of neuritis, and it is evident early in the disease, often being quite as rapid as in poliomyelists. The electrical reactions are altered—every grade of reduction in the responses being seen, from a slight dimination in the reaction to faradism to the complete reaction of degeneration. Vasamator symptoms, such as edems of the affected parts, glassiness of the skin, etc., are often present. Deformities from muscular contraction occur early; they may be severe, and in some cases, permanent.

Course and Prognosis.—The usual course of the disease is for the symptoms gradually to increase for three or four weeks and then improve, sometimes rapidly, but more often slowly, the case usually going on to complete recovery in the course of a few months. Exception-



Eso. 139. — Measures: Necessire airtis Directions in a Catas. Form Years Oto. The position of the level and spine is the to purify purifye of the trunk and neck. The legs were also affected.

ally the paralysis may be permanent. The sensory symptoms always disappear before the motor ones. Multiple neuritis may prove fatal, from paralysis of the heart or the nuncles of respiration, or death may be due to asphyxia from the entrance of food or foreign bodies into the air passages, owing to anesthesia of the spiglottis and paralysis of the muscles of deglutition. Death sometimes follows from complications, especially preumonis. The electrical reactions are of much prognetic value.

in regard to the persistence of the paralysis. If the reaction of degeneration is present the paralysis is certain to last many menths, and some muscles are sure to be permanently affected. Where there is simply a distinution in the faradic responses, even though accompanied by marked atrophy, complete recovery may be expected, although it is often slow.

Diagnosis.—The diagnostic features of multiple neuritis are the comtination of motor and sensory symptoms with the same distribution, the occurrence of strophy, and the diminution in the electrical responses, even the reaction of disponeration. The gradual suset and the sudespread distribution of the paralysis are also characteristic. If all four extremities are paralyzed, it is altogether the most probable disease; and if to this is added paralysis of the neck and spinal muscles, the diagnosis is almost certain. The facts that the paralysis is often incomplete, and that it involves parts distant from each other, are also important. Nearitic may be mistaken for poliomyelitis, for Landry's paralysis, or for Pott's paraphogia; an important diagnostic point from the last mentioned is the condition of the reflexes—being greatly enaggerated in Pott's paraphogia, while they are diminished or lost in multiple rectribes.

Treatment.—As this disease tends in the great majority of cases to spectaneous recovery, it is difficult to estimate the value of any method of treatment. Causes, such as lead, arcenc, alcohol, and malaria, are to be sought and removed as the first step. During the neute stage the pain may be no severe as to require relief, which is last assemplished by the application of heat. In using counter-irritation much care is necessary, for treatdessens afternation may follow. After the neute stage has passed, or at the end of three or four weeks, electricity should be began, familian being used if the muscles respond to a moderate current, otherwise gal-sanists. This should be continued daily until measury. Strychnin is much used in these cases, but it is doubtful whether it has any specific influence, although as a tonic it is valuable. Other tonics, such as iros quinin, and cod-liver cel, should also be given. Massage is also beneficial. The special treatment of cardine and respiratory paralysis will be discussed in the following article.

DIPHTHERITIC PARALYSIS

This is not only the most frequent variety of multiple neuritie, but it has some peculiarities which make a separate consideration of it desirable.

Frequency.-According to the statistics of surious observers, paraly-

sis, including all varieties, occurs after dipittleria in from 5 to 45 per cent of the cases. Sanné gives 11 per cent in 2,418 cases; Lennox Browne, 14 per cent in 1,000 cases (in neither of these groups slid the patients receive antitexin); the Report of the Collective Investigation by the American Pediatric Society, 9.7 per cent of 3,284 cases which were treated by antitoxin. The most recent figures are those of J. D. Rolleston. He knowmered some form of paralysis in 20.7 per cent of 2,300 cases, all personally observed by him.

There can be little sould that since the introduction of treatment with antitoxin more cases of port-diphtheritic paralysis are observed than in the pre-antitoxin days. The undoubted explanation of the fraquency with which paralysis is seen after autitoxin treatment is that patients now live long enough to develop paralysis, when without antitoxin the same patients would have died during the early stage of the disease.

Neuritis is more likely to follow severs than mild cases. Its occurrence after some very mild attacks shows how great is the susceptibility of the nervous tissues to the action of the poison. But the great determining factor is the duration of the action of anneutralized toxin upon the nervos. The frequency of neuritis is in direct relation to the length of time chapsing before the administration of antitoxin. Rolleston's figures upon this point are illuminating. When antitoxin was given on the first day of the disease, 3.6 per cent of the cases subsequently developed paralysis; on the second day, 14.00 per cent; on the third day, 26.3 per cent; on the fifth day, 26.3 per cent; on the sixth day, 26.3 per cent; on the protection of the nervous system by antitexin can be additional.

Time of Occurrence.—During the second week, and sometimes even during the latter part of the first week, the early paralysis occurs, usually affecting the palate. The most frequent and most characteristic paralysis—that affecting the threat, eyes, extremities, and respiration—begins at a later period, smally not before four or five weeks after the threat has cleared off, and sometimes even later than this.

Extent and Distribution of the Paralysis.—Ross gives the following statistics of 171 collected cases of diphtheritic paralysis; polate affected in 128; eyes in 77, in 54 of which the muscles of accommodation were involved; lower extremities in 113; upper extremities in 56; trunk or nock in 58; muscles of respiration in 33. In the 477 cases reported by Rolleston the paralysis was distributed as follows: palate, 331 (74 per cent); ciliary muscles, 236 (53 per cent); extra-ocular muscles, 80 (18 per cent); phoryny, 26 (11 per cent); displangin, 16 (3.6 per cent).

Symptoms.—In the great majority of cases the threat is affected, and usually the paralysis is first noticed there. It may involve the palate alone, or the muscles of the pharyna or largus in addition. The muscles of the extremities or of the eye are often sext attacked. In severe cases there may also be involved the muscles of the trunk and nock, and sometimes the displiragm. Paralysis of the threat and displiragm distinguishes diphtheritic paralysis from other forms of multiple neuritis. Whitever the extent or situation of the paralysis, the knee-jerk is nearly always lost. The symptoms in the extremities and the trunk do not differ from those of multiple nearitie from other causes. The throat paralysis shows itself by a moral voice and by regurgitation of fluids through the nose, wonetimes by difficulty in swallowing or by the entrance of load into the larray, owing to anosthesia of the epiglettic and paralysis of the muscles of deglutation. There may be difficulty in protrading the tongue or in articulation. Facial paralysis is rare. On the part of the ope there is need frequently seen inability to read, owing to paralysis of the massles of accommodation; there may be dilutation of the pupils, rarely strahismus or phone,

Respiratory panalysis may be due to involvement of the plantair or the intercostal paryer, more frequently the former. Extensive paralysis of other parts-the threat, extremities, or trunk assaily precedes. The first warning is generally in the form of occasional attacks of dyspara, contetious accompanied by rough. Gradually these attacks increase in frequency and morrity. The voice is reduced to a whisper. As the duplings is usually affected, the breathing is entirely thoracic. The respiratory movements are rapid, but irregular, shallow, and ineffectival There is evanoris, also great subjective as well as objective despues. The anxiety, distress, and approbension of the patient are sometimes terrible. There is a constant dread of superding sufficiation, and the respiratory mercurents are continued only by the patient's constant efforts, otherwise they would cease altogether. After a few hours these setere symptoms may subside, to return after a sheet respite. There may be several such attacks during two or three days, in each of which death seems imminent. Unfortunately, this is the most frequent termination. Of thirty-three such cases collected by Ross, only sight recenered. Associated with these respiratory symptoms others may be present. There may be attacks of abdominal pain, vomiting, and disturbance of the heart's action-usually an irregular or intermittent pulse, which may be either manaturally slow or very rapid. In many cases the heart continues to best normally, even though the respiration is so much disturbed.

The presonitory symptoms of cardiac paralysis are an irregular or intermittent pulse, often slow, but becoming very moid from even the slightest exertion. It is always weak and compressible. The first sound of the heart is feedle and may be reduplicated. Heart block, the disassociation of nuricular and sentricular contraction, has been reported. As the symptoms increase there is marked pullor, coldness of the extremities, great restlessness, anxiety, precordial distress, and perhaps orthopness. Within twenty-four hours from the begunning of such symptoms death usually occurs. In other cases it may come soldenly without any warning, or with a warning so slight as to be overlooked. At such times it often follows some measurant exertion, such as getting out of bed, walking across the room, or so slight an effort as sitting up suddenly in bed. Fits of temper or other excitoment have at timesproduced it.

It is by no means certain that cardine paralysis is due to a lesion of the cardine nerves. Toole myocarditis appears to be a more important factor in producing the fatal result.

Death in diphthentic paralysis in senally due either to cardiar or respiratory paralysis. Of 171 cases of all varieties collected by Ross, 45 were fatal, while of Relieston's 277 cases, 85 were fatal. Death can be ascribed to the paralysis in only a small proportion of cases. It results usually from earlier failure which is due to myccarditis and not to true neuritis. Cardiac failure was the cause of death in 80 of Rolleston's 85 fatal cases. The progresses of diphthenial paralysis is grave because it indicates that a serious term of diphthenia has been present and usually that antitoxin has been given late. The pluryngeal and diaphragmatic paralyses may of themselves be fatal, the former by causing asperation presences.

Treatment.—Cases of paralysis of the trunk or entremities are to be managed like others of multiple neuritie. In severe forms of threat paralysis feeding by a stomach tube should be employed, on account of the danger of the entrance of food into the air passages. It must in most cases be continued for several days. The tube may be passed either through the mouth or the pose.

The great mortality attending the myocarditis occurring with diphtheritic paralysis shows how unsuccessful is treatment in most of the cases; still, no doubt there are instances where life may be saved by judicious treatment. In cases of threatment cardiac failure the drug most to be depended upon is morphin, hypodermically; this should be used every two or three hours in sufficient does to keep the patient under its influence while threatming symptoms are present. The patient should be kept absolutely quiet, not even being allowed to turn in bed. In responstory paralysis the general reliance is upon atropin or strychnin used hypodermically in full does, and fundination of the respinatory muscles, particularly the disphragm.

FACIAL PARALYSIS

Peripheral paralysis of the face occurring as a result of injury inflicted during delivery has already been described. There remain to be considered here cases which arise from cases that operate at a later period. The lacial arrest may be affected in any one of three situations after its exit from the cranium, in the body canal, and within the cranium.

In the first eithaltion, the principal cause of neuritis is exposure to cold, the "rhommatic" cases; but it occasionally occurs as a complica-



Fig. 189.—Parrix Panalysis or Richt Size succe Missen-dan Distance in a China Two and a Hole Yasan Oan.

tion of maunu and disease of the lymph glands of this region. The nerve is affected just after it has escaped from the stylomastood foramen, and all the brambes given off beyond its exit are involved. There is paralysis of the muscles of the forehead, those about the eye, check, now, and mouth. The affected side of the face is smooth, there is imability to wrinkle the forehead, contract the evelowice, close the eye complete-Ir, raise the protril, whistle, or blow, The mouth is drawn to the healthy ade (Fig. 130). If the paralysis is complete, there may be difficulty in drinking or in articulation. In partial paralysis the symptoms may not be neticeable while the face is at

rest. There are no sensory symptoms. The electrical reactions resemble these of other forms of neurities; there is diministion in the response to the faradic current, which is more or less marked according to the severity of the lesion, and there may be the reaction of degeneration.

In the body canal, the facial nerve is usually involved as a result of disease of the ear. In children this is much more frequent than from the other causes just mentioned. While it occasionally occurs with acute oticis, it generally accompanies the chronic form with carries of the petrous bone, which in our experience is very often tuberculous. In addition to the paralysis there is present or there is a history of a discharge from the ear, and generally there is some destines upon the side affected. The familial symptoms are usually the same as in the case first described. However, when the zerve is affected between the stape-

dius and the geniculate ganglion, there is a disturbance of the sense of taste, and of the secretion of saliva. Facial paralysis may also occur as a result of injury to the nerve during the masteid operation.

At the base of the brain the trunk of the nerve may be involved in cerebral tumor, busilar meningitis, and in fracture of the skull. In any of these conditions the auditory nerve also is likely to be affected. A not infrequent cause of central paralysis is poliomyclitis. Facial paralysis occurs in the cerebral form with hemiplegia, or more commonly it is associated with paralysis from a spinal lesion. Occasionally the facial nerve alone may be involved. The whole nerve may be affected or only one of its branches.

Prognosis.—The result is greatly modified by the causes in the different cases. In those which are due to cold, spontaneous recovery usually occurs in the course of a few works or months. In those depending upon disease of the ear, the outlook is not so favorable, and though there may be improvement, it is not were for some paralysis to be permanent. In the third group of cases, facial paralysis is only one of the symptoms, and the result depends entirely upon the nature of the cause. In poliomyclitis the prognessis is good though in some cases a certain degree of paralysis may remain.

Diagnosis.—Facial paralysis is easily recognized. It is important to separate the peripheral paralysis from that doe to a lesion above the pons, as in cases of ordinary hemiplegia. In the latter group only the lower half of the face is affected, the numeics of the forchead and those about the eye escaping, and the electrical reactions are unchanged.

Treatment.—This is coventially the same as in other cases of neuritis.

In cases due to ear disease the primary losion should receive appropriate treatment.



SECTION VIII

DISEASES OF BLOOD, LYMPH NODES, DUCTLESS GLANDS, BONES, AND JOINTS

CHAPTER I

DISEASES OF THE BLOOD

THERE are several particulars in which the blood of infancy and early childhood differs from that of older persons.

Specific Gravity.—This has no constant relation to the number of white or red corpuscles, but varies with the amount of hemoglobin. The highest specific gravity is seen in the blood of the newly born. During the first two weeks of life it sinks rapidly to its lowest point, where it remains until about the end of the second year; after this time it rises gradually until about puberty. The average specific gravity during childhood is 1,030 to 1,055.

Henoglobin.—The percentage of hemoglobin is highest in the blood of the newly born, and falls rapidly during the first few days after birth. Throughout childhood it is considerably lower than in whilt life. The hemoglobin is lowest between the third month and the second year; after the second year it gradually increases up to puberty. The nemal range in young children, as measured by the adult standard, is between sixty-five and eighty-five per cent, seventy-five per cent being a low limit in healthy children.

Red Corpuscies.—The number of red corpuscies is highest in the newly born. At this time it is from 4,350,000 to 6,500,000 in each cubic millimeter. In infancy it is from 4,000,000 to 5,500,000; in later child-hood, from 4,000,000 to 4,500,000 (Hayem). In size a much greater variation is seen in the red cells of the newly born than in those of older children and adults. In the blood of the fetus there are present nucleated red corpuscies or normalisate (Plate XII, A). These diminish in number toward the end of pregnancy. They are always found in the blood of premature infants, but in infants born at term they are seen only in small numbers and disappear after a few days. In later infancy their presence is always pathological.

Normal White Cells.-The following varieties are found in health:

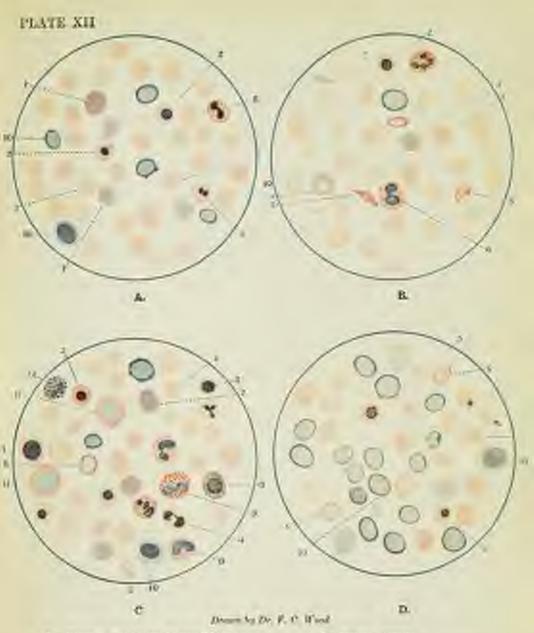
- 1. Lymphocytes:—These are small cells about the size of a red blood cell. The protoplasm is small in amount, forming merely a narrow rim about the nucleus; it stains with basic dyes rather more deeply than does the nucleus. The nucleus is relatively large, is centrally situated, and shows at times one or two nucleols. The protoplasm may have a reticular structure. These cells form in solubs from twenty-two to twenty-five per cent of the white corpuscles, but in young children they are often as high as fifty or sixty per cent (Pinte XII, B, 10).
- 2. Large Measureless Lescocytes and Transitional Forms.—Then cells are two or three times the size of ordinary red cells (Plate XII, D, 10). The eval nucleus is not so-centrally situated as in the lymphocytes, and stains fieldly but rather more deeply than the protoplasm which is poorly stained by hasis dyes. The protoplasm is homogeneous and relatively large in amount.

The transitional forms occasionally contain a few feebly staining neutrophile granules; their nuclei are bent or curved and stain more deeply.

- 3. Polymorphomedrar Neutrophiles.—These are smaller than the large lymphocytes (Plate XII, B and C, 8). The nucleus consists of three to four parts, issually connected by narrower portions, and stains darkly. The protoplasm stains with acid does and shows a great number of granules which stain only with neutral does. In adults these cells form about seconty per cent of the white cells; but in children they are less numerous, the increase in the lymphocytes being at the expense of the neutrophiles.
- 4. Ecotrophiles.—These are about the same size as the neutrophiles (Plate XII, C. 9); they have deeply staining nuclei, usually divided into two parts. The protoplasm has many large granules that stain deeply with acid dies, and often a narrow outer layer stains more deeply than the rest. They form from one to two per cent of the total number of white cells.
- Most Cells.—They are only occasionally found, their proportion being about 0.5 per cent of the white cells; they are polymorphomedear cells whose granules stain only with basic dyes, not at all with tri-acid; often they are metachromatic (Plate XII, C, 12).

Pathological White Cells .- Of these there are three principal forms;

- Myelocytes, newtrophilic.—They have neutrophilic granules and a single resoluted nucleus (Plate XII, C, 11). Ehrlieh's myelocytes differ from those of Cornil in that the cells as a whole are smaller, the nuclei are more centrally situated and stain more deeply.
- Myelcoytes, cosmophilic.—These resemble the polynuclear cosmophiles, except for the round, undivided nucleus.
- 3. Myelocytes, busuphilic.—These are similar to the most cells, differring only in the form of the nucleus.



- A. BLOOK OF M. TECHT-Morent' France.
- C. TON JURIST'S ASSESSED.

 - Bed cells, normal
 Bed cells, normalitate,
 Bed cells, normalitate,
 Bed cells, normalitate,
 Bed cells, showing mittells,
 Bed cells, politicaryon. fi. Bod cells, granular drametation.
- B. SMITH ASSESSED
- D. Acces Leavisine Locarma.
- 7. Bell cells, polyclromstophilia.
- S. White wife, provincient neutropheles.
- 9. White cells, consequents.
 10. White cells, brackerytes.
 11. White cells, tapelorytes.

- 12. White cole, must della.



These myelocytes all represent immature forms, originating in the bone marrow. Pathologically, these may be immature forms of the lencocytes, or these may undergo scute or chronic degeneration, with swelling and fregmentation, nuclear changes, hydropic degeneration, etc.

The number of leucocytes in the blood of the newly born, according to Rieder, is at hirth from 14,200 to 27,400 per cube millimeter; from the eccord to the fourth day, from 8,700 to 12,400; after the fourth day, from 12,400 to 14,800. The normal variations in infancy are from 9,000 to 18,000, and in later childhood from 8,000 to 12,000.

SECONDARY ANEMIA

This consists in an imposerishment of the blood, especially the redcells, and a corresponding diminution in the specific gravity, and in a greater proportional decrease in the amount of hemoglobin. It occurs apart from disease of the blood-making organs. Infancy and childhood are themselves strong predisposing causes of anemia on account of the great demands made upon the blood in the mpid growth of the body.

Etiology.—The causes of anemia embrace a wide range of pathological conditions. A child born of a delicate mother or of one suffering from tuberculosis or syphilis may show a marked anemia at hirth. It semetimes occurs in the first two or three mouths of life in a severe form without any discoverable cause. It may follow any severe bemorthage or occur in any of the blood dyscrasiae—purpura, scurvy, etc. It accompanies any prolonged infection with or without suppuration, also nephritis, many forms of gastro-intestinal disease and malignant growths. It is especially marked in general sarcomatosis. Certain of the specific infections, notably diphtheria, malaria, tuberculosis and themsatisms, produce a marked degree of anemia as one of their effects. It is found with great severity with some of the intestinal parasites, particularly varieties of the tape-worm and hook-worm. Anemia is at times due to mineral poisons—lead, mercury or potassium chlorate.

Much more frequent in young children than any of the above are
the anemias due to improper feeding, rickets, and unhygienic surroundings. How important these causes are and how seven a grade of
anemia may be produced by them, is not usually appreciated. The
physician is often hel to suspect some serious organic or constitutional
disease when none exists, and to overbook such common conditions and
abovious ranges as those mentioned. Anemia is seen when lactation is
unduly prolonged. It is a frequent result of an evolutive diet of milk or

infant foods into the second or third year. Older children who drink ten and coffee and eat largely of indigoetable food, pastry, cake, etc., are frequently anemic. Lack of fresh air, confinement to overheated recurand the crowding of young children in he-spitals and institutions, are common and important causes of anemia.

Symptoms.—Anemic (bildren usually exhibit many symptoms of malmstrition. Their tissues are fiable; they are generally below average weight and suffer from digestive disturbances and chronic constipation. The associated pervous symptoms are many; headaches, indefinite paids, insomnia or disturbed sleep, general irritability and a high degree of nervousness. There is easy fatigue, shortness of breath on exertion. and sometimes fainting attacks. The peripheral circulation is poor; the hands and feet are often cold. The pulse may be slightly irregular. Murmurs may be heard over the base of the heart or the large recoels. and so loud even in infancy as to be mistaken for organic disease. A venous form may be heard in the neck. Epistaxis is not uncommon. There may be enursess. Edema is rare in older children, but in severe aremias of infancy it is sometimes marked. In a certain pusher of cases, even of moderate severity, the spleen is much enlarged. Pallor of the skin and miscone membranes is present in most cases, but is not an accurate guide as to the degree of anemia. This can only be determined by an examination of the blood.

The Blood.—There is a reduction of the number of red cells and to a still greater degree in the hemoglobin. In a case of moderate severity the red cells are from 3,500,000 to 4,000,000, and the hemoglobin from fifty to sixty per cent. In severe cases the red cells may fall to 2,000,000 or 2,500,000 or even lower, and the hemoglobin to twenty or thirty per cent. These figures are not measured. Occasionally there is seen a reduction of the hemoglobin to as low as fifteen per cent and of the red cells to 1,500,000. The red cells are paid. There is usually politilecytosis and anisocytosis; and, especially in infancy, a few normalisms and megalocytes may be found (Plate XII, B).

There is generally a slight lencocytosis. The differential count of the white cells shows an increase in the lymphocytes, chiefly the small variety; the polymorphosusclear cells are relatively reduced in number.

Prognosis.—The course and termination of anemia depend upon its cause. If this is one that can be removed, as in cases depending spon improper feeding and surroundings, very rapid improvement often takes place and prompt recovery. In the most severe cases death may owns rarely from the anemia, usually from some complicating disease.

In making a prognosis in a given case the general symptoms and the cause of the anemia are much more important than the examination of the blook. If the digretive organs are in good condition and good surroundings can be secured, even though the hemoglobin and red cells are very greatly reduced, the prognosis is good. But in unfavorable surroundings and with a greatly discedered digestion, the outlook is more serious.

Typical blood examinations of a mederate and of a severe case of sevendary anomia in a young child are as follows:

SEVERE ASSESSA	MODORATIC ANEMIA
Hemoglobis 20 per-	
Red blood cells 2,500,00	00 Red blood cells 4,000,000
White cells	White relia
Polymorphonaclear 30 per	
Small monovaclear 45 per	Control Contro
Large monounclear 25 per	
Other forms	cent. Other forms

The treatment of all the forms of anemia will be considered together at the close of the chapter.

CHLOROSIS

Chlorosis usually occurs in young girls about the time of puberty. It is characterized by a peculiar greenish-yellow tint of the skin, and is not accompanied by emeriation. The changes in the blood consist in a very great reduction in the hemoglobin without a corresponding diminution in the red corposeles.

Etiology.—The exact cause of chlorosis is not yet understood. The disease rarely occurs in males; it is usually seen in girls between the fourteenth and seventeenth years, and more often in blondes than in bruncties. Heredity appears to be a factor in some cases. Other causes are compations deleterious to health, such as employment in factories or confinement in ill-ventilated rooms; insufficient food or clothing; psychical disturbances, like grief, care, or fright; excessive mental or physical strain, and disorders of menstruction—although the latter are perhaps more frequently a result than a cause of the disease.

Lesions.—Chlorosis is not a fatal disease. In the few cases with chlorosis that have died of other diseases the lesions noted have been dilatation of the right heart with hypertrophy of the left ventricle, a small aceta, small uterus and ovaries, and occasionally round abor of the stomach. Under the microscope there may be found a very marked degree of fatty degeneration of the heart muscle, and sometimes of the same coat of the blood-wassels.

Symptoms.—The general symptoms of chlorosis are very much like those of simple anemia. There are observed shortness of heath upon exercise, pulpitation, sympose, attacks of vertigo, disturbances of diagration, amenorrhos, and almost invariably constipation. The appetite is capricious, it being a peculiarity of these patients to erave all sorts of indigestible articles. Instead of the usual pallor of anemia, the skin has a pellowish-green tint, from which the term "green-sickness" has arisen. Occasionally patches of pigmentation are seen. Anemic cardiac morniors may be heard in various situations, most frequently a systolic mornior at the base of the heart, and usually loudest over the pulmenic area. There may be a remora hum in the neck. In some marked cases there is evidence of slight cardiac dilatation, especially of the right heart, and there may be hypertrophy of the left ventricle. The pulse is weak and soft, edema of the feet is frequent, and sometimes there is slight alleminumia. In some cases there is fever. Nervous disturbances, such as vague, indefinite pains, attacks of migraine, supra-orbite' neuralgia, various hysterical manifestations, and choren, are common. Ulcer of the stomach is semetimes seen as a complication.

The Blood.—The specific gravity is reduced in proportion to the loss of hemoglobin. The characteristic feature of chlorosis is a loss of hemoglobin which is out of proportion to the reduction in the red cells. The hemoglobin in an ordinary case is frequently as low as thirty-fire or forty per cent, while the red cells may be 3,500,000 to 4,000,000, or even

higher.

Morphologically the cells are pale with a wide central clear area. Polkilocytosis may be present, but is not marked; rarely normoblaits may be found. The presence of megalocytes is disputed. The leurocytes are usually enchanged in number and proportion, but the lymphocytes may be relatively increased.

Prognesis.—The course of the disease is essentially a chronic one, often lasting for a year. Relapses are quite frequent. These cases

regularly recover when proper treatment can be carried out.

Disgressis.—A probable diagnosis is in most cases easily made from the ctiology, the functional derangement of the heart, the color of the skin, and a positive diagnosis always by an examination of the blood

PSEUDO LEUKEMIU ANEMIA OF INFANCY (Von Jakob Dinnie)

This form of anemia was first described by ron Jaksch in 1889, and is by him believed to be peculiar to infants and young children. It is characterized by marked leucocytosis, marked reduction in the number of red cells and in the hemoglobou, a great enlargement of the spleen, and sometimes a moderate enlargement of the liver and the tymphatic glands. This disease is not to be confounded with pseudoleukemia or Hodgkin's disease. The existence of pseudo-leukemic anomia as a distinct disease is denied by many authorities on diseases of the blood, who regard it as a symptom-complex. They hold that the reported cases can be classed either as severe secondary anomia, permicious anomia, or leukemia.

Etiology.—Of the cases thus far recorded the majority have been between the ages of seven and twelve menths. Of twenty cases collected by Monti and Berggran, sixteen showed evidences of rickets and one was application. The exact cause of the disease is still unknown, and its recential nature is a matter of some doubt.

Lesions.—The most characteristic change is found in the spleen, which is very much enlarged, often forming an abdominal tensor of considerable sine. It is firm, hard, and there may be evidences of perisplenitis. The microscope shows a simple hyperplasia. Enlargement of the lever is less constant, it being normal in more than half the cases. There is no relation between the size of the spleen and that of the liver. The hepatic cells are unchanged. Enlargement of the lymph glands has been noted in about half the reported cases, the swelling affecting the cervical, axillary, or inguinal glands; but it is rarely great. It is due to simple hyperplasia. Inconstant changes in the bone-marrow have been described.

Symptoms. - The Blood. - The main features noted are the following (Plate XII, C):

The specific gravity is lowered, the usual range being between 1.035 and 1.044. The reduction of the hemoglobin is very great; in many of the cases it has been as low as twenty-free per cent, and in a few below twenty per cent.

The red cells are always diminished; they are frequently below 2,000,000. There is also great inequality in their size and shape. Nucleuted red cells are found in considerable numbers; as a rule, these are chiefly normalishes, but when the anomia becomes more severe, it is usually the megaloblasts that predominate. The leurocytes vary from 20,000 to 50,000. They may sheer an increase in the monomurlear or in the polymorphomateleur forms. The cosmophiles are usually increased, but not to the extent to suggest leukemia. All varieties of cell degeneration are found.

The general symptoms of the disease develop slowly and with the usual signs of anemia. In some cases the infants continue to be plump and well neurished. Pallor is usually very marked. Enlargement of the aptern is so great that it can hardly be overlooked if the abdomen is commissed. The glandular enlargements are not marked, and in many cases are wanting altogether.

The course of the disease is essentially chronic. Cases have been seen in which pseudo-leukemia developed from an ordinary severe simple

aremia in the course of a few weeks. The symptoms and blood changes generally come on slowly in the course of weeks or menths, and sometimes remain nearly stationary for as long a period as several months, and then slowly improve. In other cases they grow gradually werse. In the cases going on to recovery there is noticed improvement in the general symptoms coincident with a diminution in the size of the sphere, a reduction in the number of leucocytes, an increase in the red cells, the hemoglobin, and the specific gravity, and a gradual disappearance of the nucleated red cells.

Prognosis.—In Monti's list of twenty cases, four proved fatal; one recovered, in which the proportion of lemocytes to the red cells had been one to twelve. The prognosis should be guarded, for, although improvement may take place, many patients die from intercurrent disease.

PERNICIOUS ANEMIA

This is the most severe form of anemia known. Its cause and securial nature are as yet very imperfectly understood. It is characterized by quite uniform blood changes and by the general symptoms of a very marked anemia, and it tends to go on from had to wome, terminating fatally in the great proportion of cases.

Etiology.—Permicious anemin is a rare disease in childhood, and especially rare in infancy. Its essential course is quite anknown. In a few instances intestinal parasites, particularly tapeworms, have produced in children an anemia indistinguishable from permicious anemia.

Lexions.—There is found a very high grade of anemia in all the internal organs, tatty degeneration of the heart and blood-ressels, and sometimes also of the liver and kidners, with numerous capillary hemorthages in the various organs. A striking post-mortem change consists in the deposit of iron in the lequals cells. This is found, however, with other severe forms of anemia. Its distribution is peculiar and unlike that seen in most other diseases. The bone marrow is also markedly altered in that the red cells may be of the megaloblastic instead of the normal-lastic type. In aplastic anemia there may be a yellow bone marrow instead of the normal red bone marrow of child-head.

Symptoms.—The Blood.—The specific gravity of the blood in pernicious anemia is constantly and considerably reduced, and its congulability is feeble. The hemoglobin is always reduced; usually it is as low as from twenty to thirty per cent. The red cells are always much diminished in number and to a degree greater than the reduction in the hemoglobin. Their number is seldom greater than 2,009,000, and frequently less than 1,000,000. Megalocytes are present, often in great numbers, and a preponderance of them is regarded assential to the diagnosis. Microcytes are rare. It is characteristic of pernicious aneuse that owing to the relatively high isomoglotin content the red cellhave a high color index and stain well, usually deeper than in normal blood. A striking feature of these cases is the presence of extreme possilocytosis. Nucleated red wills are also present, megaloblasts in greater numbers than normoblasts. The red cells do not readily collect to form rouleaux. The blood platelets are greatly reduced and frequently almost absent.

The total number of lencocytes is markedly diminished, but the lymphocytes may be relatively increased. An occasional myelocyte may be found.

The general symptoms are those of a most intense arcmin. There is marked pallor of the skin and mucous membranes, with great weak-ness and prostration. Various accidental heart nurmars are heard. There may be dyspines. There may or may not be emaciation. The late symptoms are hemorrhages from the nose and other mucous membranes, subsutaneous exchymoses with dropsy of the feet and ankles, and sometimes of the large serous cavities of the body, but without alluminuris. In many cases fever is present. This may be so high as to lead to the suspicion of some acute infectious process.

The course of the disease in as a rule, more rapid than in adults, the duration being in most cases but a few months; it is marked by periods of exacerlation and remission. During the exacerlations all the symptoms are intensified, and as a rule some fever is present. During the remissions marked improvement may take place in all the symptoms and an increase in the hemoglobin and red cells occurs. In general, the progress of the disease is downward and sometimes the rate is very rapid. The only exceptions are the cases in which the disease depends upon some intentinal parasite, when improvement and even recovery may occur.

Treatment of the Different Forms of Anemia.—In accordary anemia the thing of the first importance is to discover and treat the primary condition upon which the anemia depends. In infancy, special attention should be given to diet and legistee. A mixed diet composed of fruits, heef juice, eggs and green vegetables should be substituted for one consisting mainly or exclusively of milk. Also important is an abundant supply of fresh air. The whole manner of life of these patients must be carefully studied and managed according to the directions laid down in the chapter upon Malautrition, with which condition, especially in infancy, a very large number of these cases are associated. The general treatment referred to is often more important than the

administration of the preparations of iron, which, however, should never be omitted.

The preparations of iron especially adapted to infants are the alterminate, hitter wine, sweet wine, succharated carbonate, realate, and estrate. The dose should be regulated according to the age of the chibt. Other chibtren may take the same preparations as adults, especially reduced iron and Blaud's pills. Much tenefit is seen from combining arsenic with iron, or from alternating the two. In addition to these remedies, coll-from oil should be given if the condition of the digestive organs will permit.

In chlorosis more decided results are seen from the use of iron than in any other form of animia. Bland's pills are here the favorite form of administration, and are advantageously combined with small does of now vomice and aloin to overcome the tendency to constipation. Arsenic is meful in these cases also. Great benefit in chlorosis results from change of air and change of scene, thus removing the patient from all sources of nervous excitement or disturbance. The general condition, diet, and habits of life should also receive careful attention, particularly the combition of the bowels.

It is important that the administration of iron should be continued for some time after the disappearance of all symptoms, on account of the tendency to relapse.

In the parade-tendemic sucmin of infants, arsenic is decidedly the most valuable drug, but should be given in combination with ioun. Fowler's solution is the best preparation for infants; the dose should rarely be more than one drop, which should be repeated four or for times shally after feeding, and continued for a long time. The general treatment of these patients is the same as in cases of simple anemia. When rickets is present cold-liner oil and phosphorus should be added.

In permicious anomie, arsenic offers a much better prospect of improvement than does iron. Beginning with small does, the amount should be gradually increased up to the point of telerance, very much as in cases of charge.

In every case of anomia the most careful attention should be given to the general condition, particularly guarding against exposure to cold and dampuess. The feeble circulation of these patients renders them peculiarly susceptible. Caution should also be given against much muscular exercise.

In cases of secondary anemia transfersion is a remedy of the greatest value. In acute enemia following less of blood its effects are little short of marvelous. In the primary anemias and in permicious anemia its effects are much less swident and in the great majority of cases only temporary improvement is seen.

LEUKEMIA

This is a discuse in which the essential feature is a great increase in the number of leurocytes, with a modernte reduction in the number of red corpuscles, and the presence in the blood of cell forms not found in health.

Etielogy.—Lockemin is a rare disease in childhood, but it is seen even in early infancy. Its greater frequency in makes holds good even in childhood. In a small number of cases beredity has been noted. Lenkemia may follow syphilis, rickets, malaria, or even simple anemia, or it may occur apparently as a primary disease in children previously bealthy. The cause is unknown.

Lexions.—The essential lessons of leukemia are found in the spleen, the lymphatic glands, and the bone-marrow. In some cases the most important changes are in the lymphatic glands, giving rise to the lymplatic form of leukemia. Any of the external glands of the body may be affected-the cervical, avillary, and the inguinal, or the mesenteric, tracheolyonchial, the tonsils, and even the lymph nodules of the tougue, plarenx, and intestines. The changes in the glands are generally those of a simple hyporplasia. The liver is enlarged in most of the cases, chiefly from an infiltration with lymphoid tissue, which may be diffuse or may occur in patches. Less frequently similar lymphoid masses are seen in other organs. Lessons may be present in almost any of the riscera due to secondary infectious. In lymphatic lenkemia the changes in the spleen and marrow may be slight. Changes of a severe form in the spleen and marrow are, however, negaliv seen together, giving rise to what is known as the spienomyelogenous form of the disease. The sphere is usually enormously enlarged, sometimes filling half the abdominal cavity. In the early stage it is soft, vascular, and of a dark-red color; in the late stages it is firm and hard. There may be perisplenitis. On section, light-gray patches of lymphoid tissue may be seen scattered throughout the organ, and in some instances there may be wedge-shaped infarctions. The microscope shows thickening of the tralscular and deposits of lymphoid tissue, especially about the arteries.

Symptoms.—In ocute lymphatic leukemia, which in our experience, is the most common form of loukemia in early life, the symptoms are so severe and the progress so rapid as to suggest an acute infection. It is often preceded by some other infection such as pneumonia, multiple abscesses or inflammation of the tonsile. The onset may be abrupt with severe symptoms—favor, proceed and articular pains and great prostration, but not much that is definite; or it may be more gradual with only

local symptoms for several weeks. The swelling of the external lymplatic glands may be the first thing noticed; this is most marked neually in the cervical region, but the axillary, inguinal, femoral and epitrochlears may also be involved. The individual glands may be no larger than an almond, but often reach the size of a walnut. There is no refness and seldom tenderness. The glandular swelling is usually progressive; the spleen and liver soon become large and hemorrhaps often occur. These may be subcutaneous in the form of small petechiae or larger purpuric areas, or there may be bleeding from the nose, the bowels, the bladder, or blood may be vomited. The mouth often is the seat of disease resembling scorny. In fact, these symptoms may dominate the clinical poetare. The gams are much availen and bleed easily; there may be sloughing in the gams, tonsils or baccal muccus membrane. The submixillary glands are swollen and there is much local pain and discomfort. The general symptoms at this stage are usually zerore. The temperature is nearly always somewhat elevated and it may be as high as 103° or 104° F.; there is murked dyspnea and great muscular weakness; the pulse is rapid and feeble and the loss of weight nsmally marked.

The blood picture suries greatly in the different cases and in the same case at different stages of the disease. The constant feature is the great relative increase in the lymphocytes, which usually form from 30 to 98 per cent of the white cells, and a corresponding reduction in the polymorphomedear cells. The lymphocytes are chiefly of the large variety and many of them are degenerated so that they stain with difficulty. The total foresextes in the early stage may not be increased and there may even be a leuropenia-3,000 or 4,000. Sometimes the total leurocytes fall greatly toward the mil of the disease; but genefally they are increased, numbering from 50,000 to 150,000; the red cells are uniformly reduced in number to from 1,800,000 to 3,000,000 and the bemoglobes to twenty or thirty per sent or even lower. The congulability of the blood is diminished. The course of this form of the disease is usually rapid. It may last only three or four weeks, and rarely more than two or three months. Death is due to hemorrhages, to exhaustion, or to some acute intercurrent infection.

Other cases run a less soute course and may be marked by irregular and prolonged attacks of fever which in some cases may be high and last for months, but with few other symptoms except sulargement of the lymphatic glands. The blood picture suries much from time to time, the constant feature being the high percentage of lymphocytes and a moderate degree of anemia. The total leukocyte count may be low for a long period but a marked relative increase in the lymphocytes is a constant feature. The chronic form of lymphatic leukemia does not differ greatly from that in the adult but in our experience is very uncommon in children.

In the sylenomyelogenous form of the discuse the progress is usually fess nexts and resembles that seen in the adult, but its course is always more rapid in early life. In the case reported by Knox, death occurred two weeks after the first symptoms. In most of the cases the early symptoms are latent. A sudden and alarming benerrhage is sometimes the first thing to call attention to the serious condition. In other cases there are only the symptoms of general workness and anemia. Sametimes the splenic tumor is the first thing noticed. In the early part of the disease the usual symptoms of anemia are present-digestive disturbances, shortness of breath, weak and mold subse. Hemorrhages may occur as an early or late symptom; they are most frequently from the nose, but severe hemorrhages may occur from the storach, the mouth, the intestines, or there may be endymoses upon the skin. The culargement of the spleen may be sufficient to form an abdominal tumor, so as to attract the attention even of the parents. The swelling of the liver is not so great. The lymphatic glands are enlarged only to a moderate degree, and in many cases this symptom is absent altogether. They are painless, movable, and usually several groups are affected.

The late symptoms are dropsy of the feet or general anasarea, hemorrhages, diarrises, headarles, general weakness, and attacks of syncope. Fever is quite constant in the late stages of the disease, and the temperature may be from 191° to 103° P. The mins may contain albumin and casts. Vision is sometimes disturbed by the formation of leukemic plaques in the retina. It is rare that there are any symptoms referable to the bones, although expansion and tenderness of the flat bones have been observed.

In the splenomyelogenous form the white cells may be from 100,000 to 500,000, but, especially under the influence of streets, a marked temporary diminution may occur, so that their number may be scarcely above the normal; both Ehrlich's and Carnil's myelocytes are present, and the presence of a large number of these is pathogustnosis. The number of polymorphonuclear neutrophiles is greatly increased, although their proportion is diminished. The cosmophiles are very much increased in number, monococlear forms being present. The number of lymphocytes is increased, but they tary according to the type and stage of the disease; basephilic (mast) cells, both monomiclear and polymorphonuclear, are present in considerable number, this being the most reliable diagnostic sign.

Prognosis.—The prognosis of leukemia of all varieties in children is very bad, nearly all cases terminating fatally within a few weeks or months from the first definite symptoms. The usual entires of death are exhaustion, hemorrhages, and bronchopneumenia.

Diagnosis.—The general symptoms are likely to be misboding, especially fever, dyspass and prostration. The buccal symptoms frequently suggest sourcy. A rapid general enlargement of the external lymphatic glands always is suspicious, lest without a blood examination, a diagnosis is impossible. The chief reliance is to be placed in cases of lymphatic leakenia upon the great relative increase in the lymphocytes and refuse tion in the polymorphomoclears more than upon the total number of leacocytes; in other cases the diagnosis rests upon the enermous increase in the leacocytes, and especially upon the presence of numerous mast cells and neutrophile and assimophile myelocytes.

Treatment.-Leukemia is little influenced by treatment. The reported cares must be taken with some allowance, for most of these were published before leukemia was sharply differentiated from simple anemia with leneceytain. Temporary improvement in some cases has followed the use of amenic in full doses. Hemorrhages may be relieved at times by calcium lactate. Beauch is often of distinct value in the treatment of chronic splenours-logenous leukemia. Its effect is to diminish markedly the number of white cells, especially those developed from the hope marrow. The total number of leurocytes may be reduced from a hundred thousand or more to less than ten thousand. In giving henrol, care should be observed that the reduction does not take place too rapidly. As the effect is continuous for a time after the drug is omitted. no more should be given after the total number of cells is 15,000 or 20,000. Bensel may be given in capsules beginning with seven or eight grains (gram 0.5) once a day. The dose may be increased gradually, depending upon its offect, but should not exceed thirty to thirtyfive grains (grain 2.5).

Coincident with the fall in the number of white cells there is namily a marked increase in the red cells and a great amelioration of the patient's condition. This is unfortunately not permanent though it may lost for many menths. Subsequent courses of treatment with bound bring less improvement, or may be without influence. Striking improvement has followed transfusion, but this is usually only temporary. In the great majority of cases the disease goes on to a fatal termination in suite of the measures couployed.

неморица

Hemophilia is an hereditary disease, in which there is a tendency to profuse or even uncontrollable bleeding from slight wounds. The homorrhage may even be spontaneous. Persons so affected are known as "bleeders."

Etiology.—The hereditary tendency of the disease is very strongly marked, and it has often been traced through seven or eight generations. Males are much more frequently affected than females, the proportion being about twelve to one. In the matter of inheritance, the disease is most often transmitted through the mother, who, however, usually escapes herself. Patients suffering from hemophilia may have nothing else about them that is abnormal. It has no connection with either purports or scurvy. Howell, from his extensive studies upon hemophilia, has rome to the conclusion that it is due to a relative preponderance of antithrombin. The antithrombin may be normal in amount or absolutely increased but on account of the absolute diminution in the prothrombin there is always a relative increase in the factors that delay the congulation of blood.

Symptoms.—The first manifestations of hemophina are not often seen before the second year. The hemorrhages of the newly born have no relation to this condition. The discovery of the disease is generally quite accidental. The first hemorrhage may be transmitte or spontaneous. In traumatic hemorrhages there may be very secone bleeding after so slight a wound as the drawing of a tooth; sometimes a large bematoms forms between the muscles as the result of a moderate contosion.

The following is the relative frequency of spontaneous hemorrhages in 334 cases collected by Grandidier: Bleeding from the nose in 169, month in 43, intestines in 36, stomach in 15, urethra in 16, lungs in 17. There may be hemorrhage from the skin or from any mucous membrane of the body. The attacks of spontaneous hemorrhage are often periodical, and may be accompanied by arthritic symptoms resembling rheumatisms. There are hemorrhages into the joints in some instances with severe resulting deformity.

The severity of the hemorrhages varies much in the different cases. From a elight wound a patient may bleed until he is examplificated, and even until death occurs. Such a result from the first hemorrhage, however, is rare. In some cases the disposition to bleed is outgrown in later life. Grandidier states that, of 157 keys, over one-half died before reaching the seventh year. It is striking that when the disease affects females there is no tendency to excessive bleeding at menstruation or parturition.

Treatment.—The indications at the time of biseding are, to arrest the hemorrhage by the use of the ordinary surgical means—especially compression. Calcium hectate and gelatine may be used as described in the hemorrhages of the newly horn; but little benefit is to be experted from drugs. In all marked cases transfusion should be practiced. Its effects are sometimes very striking. In convalescence after attanks of temorrhage, iron and general tenies should be given. In all patients who are bleeders everything which might by any means excite hemorrhage should be avoided.

PURPURA

The term purpura is used to designate a condition in which there is a tendency to spentaneous hemorrhages beneath the skin, from the turious mincous membranes, and in some cases into the internal organs. The term purpuses simpler is applied to those cases in which the hemorrhages are limited to the skin; purpura hemorrhagina to those in which there is in addition bleeding from the mineous membranes or visional hemorrhages. It is impossible to draw a line sharply between these two classes of cases, as the chief difference between them seems to be one of degree. Purpura is sometimes known as morbus mecalosis or as Werlhof's alicense.

Symptomatic Purpura.—This occurs in quite a variety of conditions, the hemorrhages generally being limited to the skim, but not always so.

These cases may be grouped in the following classes:

 Infectious.—This form of purpura is very constantly seen in malignant endocarditis, in the hemorrhagic forms of the various eraptive fevers—meades, scarlet fever, variola, vaccinia, and typhus—also in opidemic meningitis and occasionally in diphtheria, premia, and epticemia. The occurrence of hemorrhages in these cases appears to depend upon an altered condition of the blood-vessels, which is a direct result of the infection, and it is a bad prognostic sign.

- 2. Carbactic.—Purpture occurs late in the course of many protracted and exhausting diseases, especially in infancy. It is most frequently met with in beauchopneumonia, empyona, tubesculosis, ileocolitis, in both the tuberculous and the simple forms of meningitis, and in malignant disease. It also occurs from apparently similar causes in several of the diseases of the blood, particularly in backenia and pernissous arcmin. In most cases of cachectic purpura the hemorrhagic spots are small, not very abundant, and occur either upon the abdomen or the lower extremities. This form is quite common in hospital practice, and is almost invariably indicative of a fatal result. In carbectic purpura the hemorrhages are usually limited to the skin.
- 3. Toric.—Certain drugs, such as phosphorus, quinin, potassium chlorate, and semetimes others, may in rare cases produce bemerkages when long continued or in large doses. The hemorrhage of jaundoe may also be considered in this group.

- L. Mechanical hemorrhages, such as those occurring in pertussis of spidepsy, are sometimes classed with purpural. In consulescence from protracted illness there are sometimes seen, when patients first stand or walk, purpuric spots on the lower extremities. They may occur after the confinement of a limb in bandages or splints. In both these cases the cause is partly mechanical and partly due to the weakened condition of the blood-ressels.
- 5. Neurotic.—These cases are occasionally seen in diseases of the spinal cord and sometimes in hysteria in young adults, but very rarely in children.

Primary Purpura.—This occurs in children of all ages, being not inscommon in infancy. Hemorrhages of the newly been have not generally been included in this class. The age at which primary purpura is most frequently seen is from two to ten years. The seres are about equally affected; of Steffen's 56 cases, 27 were males and 29 females. The disease may occur in children who are cachetic, rachitic, or anemic, and in those whose surroundings are poor, but it has not, like scarry, any class relation to disc. It may follow any acute disease, being associated most frequently with decangements of the storach and bowels. Quite often the disease develops alreaptly, without any assignable cause, in children previously licality.

Lexicon.—The external homorrhages may seem upon any part of the body. There are smaller or larger exchanges or an infiltration of the tissues with blood, which undergoes gradual absorption with the usual changes. With the homorrhages, various forms of inflammation of the skin may be associated, especially crythena and urticaria, with sometimes more or less edoma. Homorrhages from the mucous membranes are more frequent, because of the feelier resistance of the tissues. There are seen exchanges upon the visible mucous membranes which resemble those upon the skin. At antepsy they are occasionally seen in the tracken to brought, but more often in the digestive tract. In the relon, and occasionally in the small intestine, ofcers may be found; but they are rarely, if ster, seen in the stemach. They may be superficial or deep, and have even been known to cause perforation.

Intraceanial bemorrhages are rare, and are usually meningeal. These pmy be sufficient to cause severe symptoms. We have seen an instance in an infant six months old of extensive meningral bemorrhagensoring a large part of the brain. In Steffen's article several such cases are mentioned. Pulmonary hemorrhages are not frequent. Ecchymassemay be found beseath the pericardium; but endocarditis and pericarditis are extremely rare, probably occurring only in the rheumatic cases. The sphere is occasionally subarged, but by no means uniformly so, and it may be the sent of hemorrhages.

While bematuria is one of the most frequent of the viscoral homorhages, severe academic is rare. Acute degeneration of the renal epithelium of the tubes is quite common. There may be punctiform homorrhages, and accaseonally larger ones beneath the capsule or in the muonic numbrane of the pelvis of the kidney. The suprareral capsules may be the seat of extensive and even latal homorrhage. There may be effusions of a sero-magnineous fluid into any of the large serous cavities, most frequently into the peritoneum. The articular lessons of purposa may be of a rheumatic character, with which purposa occurs as a complication; or there may be homorrhages into the tissues about the joint, or even into the joint itself—neually the knee or allow.

The blood shows the changes of secondary anemin—a moderate reduction in the homoglobin and the red corpuscles with occasional irregularities in size and the appearance of nucleated red cells. In the most severe cases there is a moderate degree of leurocytosis. Duke has domanstrated a constant and marked simunution in the blood platelets.

Pathogenesis.-Why it is that under certain circumstances the bloodvessels will not hold their contents, it is difficult to understand. There have been described by Cassel, Righl, Wilson, and others, changes in the small blood-ressels, nearly a form of endarteritis, but the lesions are not constant. Howell has found no changes in the factors of the blood that influence reagalation. They are present in normal quantity and proportion. Hensels has suggested the case-motor origin of purpura, in which there is first a paralytic distention of the small vessels, followed by stasis, hemorrhage, or wheme. In certain forms, as in malignant endocarditis, it is well established that the cause is an infectious thromboss. Although the bacteriological examinations made thus far in purpura have not been conclusive, there is reason to believe that infection is the essential factor in some forms of the disease, particularly in the cases characterized by sudden onset, high temperature, and cerebral symptoms, and which run a rapidly fatal course. There are, no doubt, now included under this term purpura several diseases quite distinct from one another.

The Clinical Types.—1. The Ordinary Form.—In the mild cases the hemorrhage is confined to the skin (purpura simplex), or it is accompanied by slight bleeding from the mucous membranes. There is usually some general indisposition of an indefinite character for a day or two before the purpure spots are noticed; most frequently a disturbance of digestion with scenifing, diarrhea, and sometimes slight fever. The hemorrhages appear as small petechine, varying in size from a pin's head to a pen, usually first upon the lower extermities. There may be only a few widely scattered spots or the body may be covered. The color is first a bright red, then purple, gradually fasting in the course

of a few days. New spots come as the old ones disappear, so that the amount of cruption may not diminish. They do not disappear upon pressure.

The course of these cases is generally favorable, recovery taking place in from she to four works. Betapos are, however, very frequent, and such attacks may some at intervals of a few weeks or months for a considerable period. One must be guarded in giving an absolutely favorable prognosis in any case of purpora, for it occasionally happens that in a patient who for several days has had symptoms of mild purpura, there suddenly develop those of the most severe type with a rapidly fatal termination.

2. The Severe Form .- Such cases are characterized by hemorrhages. from the mucous membranes (purpura hemorrhagica) from the outset. These may even appear before the spots upon the skin. In severe attacks the petechial spots are more likely to appear sublenly, and large explymeses, varying in size from a pen to the palm of the hand, are more frequent. There may be bleeding from the nose, gums, mouth, or pharynx, and ecolymoses may be seen upon these nuccous membranes, also upon the conjunctivae. Vorsiting of blood and bloody discharges from the lowels are quite frequent symptoms. The urine may contain enough blood to give it a bright-red color. Less frequently there are seen hemorringes of the retina or choroid and from the Jemale genitals. In one of our cases there was almost continuous bleeding from one ear. Cutaneous ecolymeses are increased by slight injuries, such as the promine from a bundage or from scratching. Epistaxis may be espious enough to necessitale plugging of the rares. The amount of blood vomited is not often large; its source may be the stomuch, the month, or the pharyax. The blood in the stools is usually dark colored, but there may be some bright-red blood even when there are no ulcers present. In one of our cases so much blood was lost by the bowels as to produce the symptons of a very marked cerebral anemia. In corrain cases the matrointestinal symptoms are very prominent, and there may be slight leterus. The discharge of blood from the stomach or intestine may be accompanied by very severe attacks of colic and tensums. In some of these cases there are pains and slight swelling of the joints. Benal symptoms are generally present. The attacks of abdominal pain with purpura and the discharge of blood may come on purcay smally every few days for a period of several weeks. They have been ascribed to thrombosis of the intestinal vessels. This is sometimes known as "Henoth's purpura,"

Constitutional symptoms are present in most of the severe cases. There is usually fever, from 181° to 163° F., and sufficient prestration to keep the patient in bed. If the amount of blood lost is large, there are the usual symptoms of severe anomia. The loss of blood may be

sufficient to cause death, particularly in infants. Cerebral symptoms may depend upon anemia or upon menongeal hemotrhage. They are not frequent in this form of the disease. Edena, especially of the face and feet, may exist without albuminuria, and albuminuria may be preent in cases in which there is no renal hemotrhage.

In some of the cases beginning with severe general symptoms, and occasionally when the onset is mild, the patients after a few days pass into a typhoid condition with low delirium, great prostration, weak and irregular pulse, dry, cracked tongue, and high temperature. Such cases are almost always fatal. They are not to be confounded with ordinary typhoid ferrer complicated by purpura.

The course varies much in the different cases. It lasts from one to aix weeks, the symptoms slowly subsiding, but often showing a strong tendency to recurrence. The programs depends upon the age of the patient, the extent of the hemorrhage, and the presence or absence of

septic symptoms.

- 3. The Hyperscate Form (purpars falminans).—This is a rare form, especially in young children. Its development is usually sudden, with a chill, vomiting, marked prostration, and high temperature. The purparie spots come out with great rapidity, and in the course of a few hours or a day they may be very extensive. In addition to the ordinary subcutaneous hemorrhages, bloody vesicles may form upon the skin. In many cases the hemorrhages are limited to the skin, the mucous membranes and the viscera raraping altogether. There is no bendency to gangrene. Cerebral symptoms are invariably present and usually prominent; there may be delirium, dalness, stupor, and finally come. The spleen is apt to be subarged. The urise is nearly always alluminous. This form of purpars has all the characteristics of a general infections disease, and it is almost invariably latal.
- 4. The Gangrenous Form.—Sleughing is not common in purpura, but it is most often seen in the mucous membranes. Other refers to two cases afferting the uvula. We once saw a slough which caused perforation of the soft palate. Wickham Legg reports a case with gangrene of the prepoce. Gangrene of the skin is even less frequent, although cases have been reported even in young children. Charron's patient was only three years old, and several others in children are collected in Gimard's monograph upon this subject. The gangrene may involve the skin only, or the subsutaneous tissues, and even the muscles. It has been seen upon the upper and lower extremities, and even upon the face, and may extend over quite a large surface. In some of the milder forms of purpura, gangrene results from some slight injury, such as a blow, the pressure from a lundage, or, in the nose, from the pressure of a tampon. These cases are almost invariably fatal. Those in which the sloughing

is confined to small areas of the morous membrane of the mouth often recover.

5. The Rheumatic Form.—The term "rheumatic purpurs" (pelisius rheumatica) is applied to eases, not so common in children as in older patients, in which subcutaneous bemorrhages, and sometimes blooding from the mucous membranes, are associated with painful joint swellings. These are to be regarded as cases of rheumatism complicated by purpura. The joints most frequently affected are the knee and the ankle. The arthritic symptoms are usually less severe than in attacks of acute rheumatism. There may be present crythesia exidativum or crythems nodosum or urticaria. Usually there are throat symptoms and fever, and frequently edema of the face and credits with albuminuria. The spleen may be enlarged. The usual duration is from one to three weeks, and although relapses may occur, the cases usually recover.

Joint symptoms, particularly articular pains, are not infrequent in the course of resider attacks of purpers without the febrile symptoms mentioned. In severe cases extravasations of blood have been reported as accurring in the tissues about the joints, and even in the joints themselves, these being cases of true arthritic purpura. It is probable that in the past some cases of scurvy have been included in this group.

Diagnosis.—The raped acute cases may be confounded with the hemorrhagic forms of the various eruptive fevers. The ordinary subscute or passive forms are chiefly to be differentiated from scurvy. The diagnosis is not difficult, and the mistake need not be made if the essential features of scurvy are borne in mind—its dietetic cause, bleeding gums, hyperesthesis, and deep rather than subcutaneous hemorrhages which are usually near the joints.

Prognosis.—This depends very much upon the form of the disease, Of 128 cases of all varieties occurring in children in Steffen's collection, there were 40 deaths. In 12 cases of severe primary purpora reported by Gimard, there were 3 deaths and 9 recoveries. Purpora simplex is rarely fatal; cases of purpora hemorrhagica usually recover unless marked febrile symptoms are present. The forms classed as typhool, gangrenous, and purpora fulminants are almost invariably fatal. The feudency to relapse exists in all varieties.

Treatment.—The treatment of symptomatic purpurs should have reference to the cause of the disease. The mild cases of primary purpurs neually recover promptly under a tonic plan of treatment. The more severe cases require confinement in hed, absolute quiet, and care to avoid exposure and even the slightest injury or extra pressure upon any part. Drugs do not seem greatly to influence the course of the disease. Those most frequently coupleyed are epinephrin, hydrastis, hamamelis. assimatic sulphuric acid, the vegetable acids, ergot, and gallie acid. Whether or not it is true, as claimed by some, that all homorrhagic diseases are related to scurvy, the striking improvement seen in this disease from the use of fresh fruit and vegetables suggests their employment in purpura. In some cases very decided benefit seems to follow their use in the acute stage, but more particularly in convalencence. For hyperacute and gaugemous cases, little can be done except to treat the symptoms. Surgical means of arresting the hemorrhage are rarely mecessful. In all severe cases transfusion should be tried.

CHAPTER II

DISTASES OF THE LYMPH NODES (LYMPHATIC GLANDS)

It is characteristic of infancy and childhood that the lymphoid lissuce—tonsils, adencids, external and internal lymph glands, and many smaller lymph modules throughout the body—are prone to swelling and hyperplasia. In robust children infectious processes of the nose, pluryns, or bronchi cause scute swelling of the lymph nodes in the neighborhood, which rapidly subside when the cause is removed. In others, in whom this subscrability of the lymphoid thomes exists, the hyperplasia in the lymph nodes is out of proportion to the exciting cause and continues after the cause has censed to operate. Certain children have at hirth an excessive development of lymphoid tissue, particularly in the region of the throat in the form of enlarged tonsits, adenoid vegetations of the pharynx, etc.

The influence of heredity in equing this condition is too often seen to be passed over as a coincidence. Frequently the parents, during childhood, suffered from the same condition, and often every member of a large family of children in affected. They may be in other respects healthy, reared amid good surroundings, and show no evidence of any other constitutional disease. Any disease in the pursuits in consequence of which children are been with tissues butting less than normal re-

sistance, may be regarded in the light of a remote cause.

The condition is seen in perfection in children reared in institutions and in crowded tenements. It is more common in cities than in the country. Anything which produces malnutration or lowers the general situlity of the tissues may be ranked as a cause. Rickets is often associated.

During infancy, the lymphoid structures most frequently affected are those connected with the gastro-cottene and the brouchial mucous membranes; in later childhood it is those which are connected with the pharma and tensils.

The degree of enlargement of the lymph nodes which is sometimes found in the different situations has often led to misinterpretation. They have often been connected with pathological conditions or clinical symptoms with which they have really nothing to do.

As age advances we usually use retrograde changes in the different groups of glands unless they become the seat of tuberculous infection. Those connected with the digestive tract generally begin to diminish after the second year, and by the fifth or sixth year the enlargement has almost disappeared; while the tensile, adenoid growths of the plarynx, and enlarged cervical glands are usually stationary after the seventh or eighth year, and frequently undergo quits a marked strophy about the

	Name or one Classes.	Neanes and Ampanies.	Oncare on Annue Prom where tells Richard Lympuspers
1	Subscript-	One or two at maps of	Scalp, posterior pertion.
2	Marteld.	Four or five small care; in mestod region.	Receive efferent reseds from group L and through them free part of scale.
3	Perotid.	Five to ten; on the surface and in the substance of the pureful gland.	Scalp, frustal and purietal portions; orbit, posterior part of used fouca, upper jaw, posterior and upper part of plantyne.
4	Submanit- lary.	Tenhe to fifteen; along time of jaw, beneath pervical facts.	Mouth, lower kp, gutas.
5	Supra- layord	One or two median line be- tween this and houst	Chin and middle portion of lower lip.
a	Superficial cervical	Five or more; along exter- ind jugglar vein, bearath platyonia, but superfi- cial to the atemorus- tial.	Auricle, part of scalp, skin of face and north, and some efferent ven- mis from groups I and 2.
7	Deep certi- eal upper set.		Lower part of pharyux, laryux, pal- ate, tonsile and part of tourne, part of monal town, deep muscles of head and neek, and from builds the maxim. Henceyo also effected vessels from groups 3 and 4.
8	Deep vervi- cal lineer set.	A chain in the supractivity ular form.	Connect with axillary group by a claim along axillary artery; also with glands of mediastician and with groups 7 and 9.
0	Sub-hyrid.	A few result glassis below byold bone and near tor- dian line.	Communicate with group 8, and may connect below with chain of bron- chial plants.
10	Retrophot- yagral	Two small glands in front of spine and upon pre- vertebral muscles.	Phorynt and part of nand fosse.

time of puberty. The presence of these colarged lymph nodes and the catarrhal condition of the mucous membranes with which they are associated, are important in relation to all arms infectious diseases which affect these mucous membranes. They bring about an increased suceptibility to scarlet fever, measles, diphtheria, and most of all to tuberenlosis.

In the table on the preceding page are given the situation and drainage areas of the various groups of lymph nodes of the head and neck which play so important a rôle in infancy and childhood.

SIMPLE ACUTE ADENITIS

This is an acute inflammation of the lymph nodes which in inflamy frequently terminates in supportation. A certain amount of inflammation of the lymph nodes occurs in children in all scate processes affecting the muccos membranes, especially when they are sentre or prolonged. These in connection with the various internal organs are considered with the diseases of those organs. Acute inflammation of the external nodes is of sufficient frequency to require separate consideration. While this is probably always occurdary to some pathological process in the skin ar uncous membranes, the primary condition may be so slight as to be overlooked, and the adenitis may be the more important condition or may even assume the appearance of a primary disease. It is particularly in infants that this is seen, and it depends upon the unusually active absorption and upon the susceptibility of the lymphoid tissues at this age. The cervical glands are frequently affected, occasionally those of the axillary and inguinal regions.

Etiology.—Acute adenitis occurs in children of all ages in connection with diphtheria, scarlet fever, measles, and epidemic catarrh. In such cases it is often severe, and after scarlet fever not infrequently terminates in supparation. With the simple acute catarrhal processes of the pharyus and rhinopharyux adenitis also occurs, but it is usually mild and rarely such in supparation. In infancy, on the other hand, acute adenitis from simple catarrh is not only very common but often severe, and frequently terminates in supparation. Ulcerative stomatists, carious teeth, occurs of the scalp or transactions, may strite adenitis in children of all ages. Axillary adenitis may result from vaccination; inguinal adenitis, from balanitis or vulvousginitis.

Of 109 cases of acute adenitis from our records, not including any associated with diphtheria, measles, or scarlet fever, more than threefearths occurred in the first two years, and half of them in the first year of life. This susceptibility of infants is very striking. The disease occurs frequently in those who were previously healthy, and often when the evidences of disease of the nursess membrane are slight. This is true not only of the cases of corvical adentits, but also of others in which the inguinal glands are incolved. The inflammation is usually assoriated with the streptococcus or staphylococcus, occasionally with the pneumococcus or influence bacillus.

Lexions.—The changes taking place in the glands are acute congestion, with swelling, edema, and active hyperplasia of the lymphoid elements. The process may terminate in resolution or in suppuration according to the intensity of the infection and the susceptibility of the tissues. When severe enough to cause suppuration, the adenitis is ac-

rempunied by considerable inflammation of the surrounding cellular tissue.

In the series of 199 armic cases to which reference has been made, not including the specific infections diseases, 96 were cervical, 9 were inguinal, and 4 axillary; sixty-two per cent terminated in suppuration, the latter being nearly all in infancy. Suppurative of the cases. Suppurative retropharyngeal admitis (retropharyngeal admitis (retropharyngeal abscess) was associated in several cases.

In infancy the disease is usually unilateral, or, if tolateral, the glands of one side are more severely affected than those of the other. Suppura-



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Showing the most broggest singular
of the tumor in the certical region.

tion is nearly always of one side, and usually the abscess starts in a single gland.

Symptoms.—The symptoms and course of the adenitis of the specific infections discuses belong to their clinical history. Supportation is infrequent, except after searlet fever.

The typical cases of acute adenitis are those which occur in infancy. There are present the symptoms of the original disease—usually acute catarrh of the case or rhinopharyax, mouth, or car, which may not be severe, and sometimes is overlooked. The glands most frequently affected are the deep corvical group. The tumor appears just below the angle of the jaw at the anterior border of the sternomastoid muscle (Fig. 131). The swelling during the acute catarrh is not rapid or great, but continues after the original process has subsided until it reaches the

size of a walnut or a hea's egg. In the most acute cases there is marked inflammation of the periglandular cellular tissue, with pair, temberness, and extra heat. If supportation occurs, it is generally evident in the latter part of the second week, but sometimes it may be as late as the third or even the fourth week. In the axillary or inguinal region (Fig. 152) the symptoms of adenitis are essentially the same as in the neck. In the inguinal cases the degree of catarrh of the muonus membrane is often very slight.

Most cases run their course with slight fever and few general symptems; but in young infants the constitutional symptoms are often senare and the physician may be in doubt whether the local process is sufficient



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to explain them. The temperature may be from 102° to 104° F, for several days, with considerable prostration, which is much uncrossed if there is complicating utitis. After supportation, if freely opened at the proper time, the abscess heals repidly and permanently, a sinus being rare. Occasionally the infection extends from one gland to another, and a succession of these glandular abscesses occurs.

In the non-suppurative cases the swelling may be even greater than in those which suppurate; but it is less diffuse and apparently limited to the gland. It subsides slowly in the course of from four to eight

weeks, often leaving a small tumor which may be apparent for scretal months. In susceptible whildren recurrent attacks of acute inflammation may lead to chronic calargement which may last indefinitely. These, glands do not become cheesy, except from subsequent tuberculous infection.

The scate cases in coloncy in which supportation occurs, appear to recover about as promptly and quite as completely as those terminators in resolution, although in the former the constitutional symptoms are more severe.

Diagnosis.—This is usually easy if it is remembered that, with the exception of the specific infectious diseases, and sometimally local causes like reterns of the scalp, carrious both, etc., acute suppurative admitts is recentially a disease of infancy. It is often mistaken for mamps when the swelling is arrere, but on close examination there is but little

resemblance between the conditions. The disease is usually sents, and has little in common with the abov supportation seen in later childhood from the breaking down of inherculous glands. In the occasional cases seen in which the disease runs a slower course a diagnosis from the tuberculous form may be asided by a tinherculin test.

Treatment.—Prophylasis requires that in all acute enterths the mucous membrane should be kept as clean as possible by the use of rasal or pharyageal sprays, or by careful syringing with simple solutions like

Dobell's or Seiler's, or a simple saline.

In the stage of arute inflammation very lot applications or an icobag may be used for the relief of pain. It is very doubtful whether either of these means has much influence in preventing supparation. If abscess forms, include should be deferred until pointing has taken place. If this plan is followed, refilling is rare. A simple incison with proper aseptic treatment is all that is required. Curetting may be done if there is much broken-down tissue present, but it is not usually necessary. In most of the cases the abscess promptly heals and a perfect cure takes place. Benefit is assistent seen from painting with todin or from immetions of solin outracent or the obester of mercury. If elemitis is secondary to carrons teeth, eccena, or observing stomatitis, these conditions should receive appropriate treatment. Such cases do not usually suppurate, but subside rapidly when the primary cause is removed.

SIMPLE CHRONIC ADENITIS

This consists in a simple hyperplasia of the lymph nodes which is non-syphilitic and non-tuberculous. There are considered here only the external glands, but those of the covities of the body are affected in a similar way, in diseases of the mucous membranes with which they are connected.

Simple chronic admitts is not so frequent as the acute form in infants, and it is less common after the third year. It may follow one or more attacks of acute admitts, or it may result from subscute or chronic inflammations of the skin or of the various amounts membranes, infection from which causes the acute form. Chronic enlargement of the glands of the neck is very common with admoids, diseased tonsils and with pediculous of the scalp.

Symptoms.—The glands upon both sides of the neck are usually involved, and more often a group than a single gland. The degree of swelling is not generally great, being much less than in acute adentitie, and usually less than in the tuberculous form. There are no constitutional symptoms. Hypertrophy of the tennils and adensid growths of the pharynx are frequently associated. There is no tendency to suppuration or casestion. The swelling usually increases slowly for one or two months, then remains stationary for about the same length of time, after which it slowly schooles. A subscute course is more frequent than a very chronic one.

Diagnosis.—These cases are especially to be distinguished from the much more frequent cases of tuberculous adentits. The most important points for differentiation are, that they occur most frequently in children under two years, a period when tuberculous adentits is not very conmon; some definite exciting came is usually present; caseation and supparation do not occur; the glands do not become adherent to the skin or to the deeper tissues; they usually enlarge more rapidly than do the non-caseating tuberculous glands; and they are influenced to a greater degree by constitutional treatment. The children do not usually respond to the tuberculin test.

Treatment.—Operative measures are not called for in simple adenitis. Local causes usually found in the pharpux, nasopharyax, or mouth should be removed if possible. Pediculosis should be treated. Often more can be accomplished by removal to a climate in which the child's estarrhal symptoms are relieved than by all else. Little benefit is seen from local applications. The most useful internal remedies are, the syrup of the iodid of iron (twenty drops three times a day to a child of four years), and arsenic (two or three drops of Fowler's solution three times a day). Cod-liver oil should be given continuously except during warm weather.

SYPHILITIC ADENITIS

It is quite rare that a marked degree of glandular enlargement is seen as a symptom of hereditary syphilis; indeed, it is so rare that it is often forgotten that chronic multiple glandular enlargements are ever due to this disease. In the few examples that have come under our observation, this has been a late symptom of hereditary syphilis. The glandular colargements were cervical and multiple, and the degree of swelling was often marked. They may be associated with disease of the hones or of the suscens membrane of the throat or of the nose, or without signs of such disease. The diagnosis of syphilis rests upon the association of other late manifestations of the disease—keratitia, periosities, deformatics of the teeth, the Wassermann reaction, and the prompt improvement under antisyphilitie treatment: In their local appearance they recemble tuberculous glands.

TUBERCULOUS ADENITIS

(Scropule)

Tuberculous disease of the lymph glands of the cavities of the body is discussed elsewhere; only that of the external glands is here considered. This condition persons some striking peculiarities: it is not common in infancy, although one of the most frequent forms of tuberculous in older children; it often exists as the only apparent tuberculous lesion in the body. In the great majority of cases it is the cervical glands which are affected.

Etiology.—The age at which inherentons of the certical lymph glands is most often usen is from three to ten years. In tuberculosis in infancy, the external glands are not usually involved, while the broughtal glands are almost invariably the seat of infection.

The cervical glands become involved as the result of a descending infection from the rhinopharynx or of an ascending infection from the bronchial glands. The descending infection is altogether the most consmon one. The tensils and less commonly the adenoid tissue of the rhinopharynx become tuberculous from the spatian coughed up from the lungs or from organisms received into the mouth from outside. From the foci in the pharynx the path is direct to the cervical glands. Local pathological conditions that affect the tousils and islensid tissue and so favor the development of tuberculosis are chronic pharyngitis, disease of the tousils and carious teeth. Attacks of grippe, measles and scarlet fever, frequently play the rôle of exciting causes. The question often arises whether the process is at first a simple one and later becomes tuberculous, or whether it is a tuberculous one from the beginning. Our own belief is that in practically all cases the process is a tuberculous one from the outset.

Of 97 cases of tuberculous adentitis in children studied by Park and Krumwiede, 51 showed the human type of bacillus and 46 the bovine type. The proportion of cases of bovine infection was much higher in children under five years of age than in those who were older (61 and 38 per cent respectively). These findings showing the frequency of bovine infection are in striking contrast to those obtained by them in other forms of tuberculosis in children and point unmistakably to food or mouth infection, most probably tuberculous milk, as a cause.

Lesions.—It has already been stated that in the great majority of cases the certical lymph nodes are involved, and generally they are the only ones affected. In 155 cases of tuberculous glands in the series reported by Treves, those of the neck were the sort of disease in 145 and

the only seat in 13t; those of the axilla were involved in 17, but above only in 4; the groin in 8, and alone in 6. The nodes first affected are most frequently the upper set of the deep cervical group; sometimes, however, it is the superficial nodes of the submaxillary, or the parotid group, and scensionally the submental or the pre-surricular. The chain of deep recrical nodes which is involved, follows the carotid artery, and often extends some distance helest the clavitle. These deep nodes are sometimes connected with the bronchial group, but it is much more frequent to trace them upward to the tonsils which in a very large propertion of the cases are toberculous.

The process in all tuberrulous glands is poentially a chronic one, but pathologically the cases may be divided into two groups, corresponding somewhat to the forms of disease seen in the large. In one group the process is more rapid, and tends to carry cascation and softening; the products of inflammation are mainly collular, and the amount of fibrous tissue is small. In another group the course is slower, and thous tissue profominates, cascation and softening being lair or absent.

In the first group the glands in the early stage are evolien, of a pale pink color, and Louisemeous; later they become more firm, and shew, as the first gross evidence of talerculous deposits, small grayish-white spots, which are generally numerous and coattered through the affected gland; these spots enlarge, and may conferce to form one large gray mass, involving nearly the whole gland. Subsequently there is cascation and then softening, usually beginning in the center of the massess area. Inflammation within the gland is followed by that of the surrounding tiones, which may result in adhesions or in the formation of a peri-glandolar abscess. The first change in the gland is the production of epithe-Bood and grant cells, about which there is a none of small round cells; cheery degeneration then begins in the center. The cuscous masses may become energenlated by the production about them of filenes tissue; or softening may occur at one or more fori, and an alscess form. Such an aboves contains curdy material, but very little true pus, the contents being chiefly detritus from the broken-down note. Tubercle barilli are negally more numerous in the early stages of the process, but are often difficult of detection in broken-down tissues, and the rurdy pur is sometimes sterile. As the glands soften, the process gradually extends from the center to the surface, and they become adherent to the surrounding structures-blood-vessels, nerves, or the fasen-they fuse together and form large knotty masses, and when they ultimately break down they lead to the formation of an abscess in the cellular tissue, finally involving the skin. In the Isem of suppuration which occurs in and about taberculous nodes, an important part is often played by other bacteria. usually the staphylococcus or the streptococcus.

In the second group of cases, where the process goes forward more slowly, the changes are not quite the same, the essential difference being that the amount of fibrous tissue is much greater. These nodes are not so vascular; they are lough and hard, appearing like small fibrous tumors. The capsules are greatly thickened, and under the microscope is seen fibrous tissue arranged in concentric layers, often inclosing small caseous masses. These nodes less frequently form adhesions to the surrounding tissues, and consequently are freely mouble, while suppuration is quite exceptional. Although the separate timors are much smaller than in the first group, the glandular mass is often a large one, because of the number of glands involved.

It is seldon in either group of cases that the process is limited to a single node or even to two or three nodes. Very often an entire chain is involved.

Tuberculous infection of the lymph nodes may terminate in resolution, encapsulation, calcification, or supportation. The inflammation may subside before cascation has taken place and the inflammatory products undergo absorption. After cascation has occurred the masses may become encapsulated and contract to small fileons nodules. Calcification of the glands in this location is rare. In other cases cascation is followed by breaking down, liquefaction, and an external abscess. The course which the local disease takes will depend upon the intensity of the infection and the general vigor and resistance of the child. There is seen in most cases a tendency of the inflammation to subside spontaneously about the time of puberty. Cure has sometimes followed an attack of intercurrent disease, such as crystpelas of the face, and even searlet fever.

Symptoms.—In the early part of the disease there are no symptoms but the glandular swelling, and this usually begins gradually. In many cases both sides are involved, but as the disease progresses the advanced changes are usually confined to one side. In other cases the first swelling noticed is an acute one, but, unlike other acute enlargements, it does not subside, but persists. The symptoms in most cases are characterized by remissions and exacerbations; the glands increase for a time and then remain stationary or even diminish, to take a new start from the stimulus of some fresh infection of the mucous membrane with which the glands are associated, such as an attack of measles or influence, or simply from a deterioration in the patient's general health. During exacerbation the glands may be painful and tender and show the usual signs of local inflammation.

The whole course of the disease varies from several months to as many years. As a rule the younger the patient the more rapid its progress. Treves gives three and a half years as the average duration when suppuration occurs, but in infancy the glands sometimes break down in two or three months. The glands first affected are usually those situated near the hifurcation of the common carotid artery. Such tumors usually make their appearance just in front of the sternemastoid muscle -e-metimes behind it-and at the level of the upper border of the largest or the brood bone. In the more rapid cases the tumors usually attain a considerable size in three or four months, sometimes in half that time. The usual size reached is from that of an almond to an English valuet. At first the tumors are movable and preserve their distinct outline; later they become adherent, first to the deeper tissues and to each other, finally to the skin, and there is formed an irregular nodular mass in which it is sometimes difficult to make out the individral glands. As the process approaches the surface there are small spots of softening; then there is distinct fluctuation; the skin becomes discalored and finally gives way, and there is a discharge of thick, cardy pas. which may continue for an indefinite time, until the whole of the brokendown gland has been thrown off. This course is repeated with each sucressive gland which breaks down. In cases progressing more sleady the glands become afterent chiefly to one another, and supportation is less frequent.

In what proportion of inhervalous lymph nodes suppuration occurs, it is difficult to say. Like other tuberculous become in the body, this one is much more frequent than was once supposed; formerly, if glands did not break down in a few years, they were usually regarded as non-tuberculous. We now know that a large number of inberenlous glands do not break down for many years and some never do. Two forms of supperstion occur in connection with tuberculous glands-one an aboves of the gland proper, the other outside of and usually over it. In a typical case of the first variety, the gland is distinctly outlined and often superficial, there is very little inflammation, the spot of softening and fluctuation is small, and the pus discharged is always cardy. In the second variety the aboves is preceded by a more diffuse swelling, and the outline of the pland may not be made out; the signs of inflammation are more marked. the area of fluctuation is larger, and the pus is more like that of any ordinary abscess. Often the two varieties are combined; as when a gland beneath the deep fascia breaks down and there is formed directly over it an absence in the cellular tissue, which communicates through a narrow opening with the gland beneath. In such cases the sinus cantinnes open for a very long time, until the whole of the gland has been discharged. If bealing occurs before this, the cleatrix soon breaks down,

When absences are allowed to open spontaneously, large, irregular, and usually very intractable obsers form. The skin is undermined for a considerable distance, and it has an unhealthy appearance. Such ulcers semetimes continue for many months in spite of all treatment, particularly if the patient's general health is poor. The scars left after them are large and ansightly, and sometimes positively deforming (Fig. 138). Their appearance is quite characteristic. They often have many tabs of skin attached to them; they may form prominent ridges which undergocontraction like those after burns; they are of a purplish-red color, and adherent to the deeper tissues. They are often sensitive and painful.

As time passes they atrophy and become less conspicuous, though they remain throughout life.

The general health of children with tuberculone glands of the neck is usually but little affected. Although the local process is often extensive the absence of general symptoms is striking, and the seconthary development of generalized tuberculous isinfrequent. Both these facts indicate that boxine infection in the human subject is relatively mild. At any time in the course of the disease an examination of the therest offers sheers uplarged tousils, but even when they are not gross-



Fig. 123.—Circumstee Followerse a Nuolaceum Case or Transectures Assesses, in a Gist Serger Yalas Ollo. There is also a telescopium patch upon the skin of the cheek in a not infrequent becation.

ly altered, social section proves them to be inherculous in a large propertion of the cases.

Prognosis.—Tuberculosis of the external lymph nodes is soldom if ever the direct cause of death; although the course is often very protracted, ultimate recovery can usually be predicted. Treves states that the percentage of those who die from general tuberculosis is so small that this danger is not to be considered an argument for operation. Power reports that of 58 cases treated by operation, only 3 were known to have died from tuberculosis. Dowd has collected reports of 209 cases, chiefly haspetal patients, treated by remoral more or less complete, whose course was followed for several years after operation. Of those, 202, or 63.4 per cent, were apparently cured; 57, or 18.4 per cent, were living, though suffering from either local or general tuberculous; 59, or 16.2 per cent, died of tuberculous. These statistics hardly support the hopeful views of the writers first quoted, but they are, we believe, more in second with general experience in the class which makes up hospital patients. In private practice the results are much believ.

Diagnosis.-The diagnostic features of tuberculous glands are the are of the patient-usually from two to ten years-the site of the primary excelling, the indolent course, the triding original cause, and the disposition to slow cascation, softening, and abscess. The cutaneous tuberenlin reaction is of great assistance in diagnosis; in a young child a positive reaction is significant, while at any age a negative reaction is usually conclusive. The cases of simple inflammation are usually in children under three years, their progress is much more rapid. If they do not treak down they generally disappear in the course of four or five months. They usually supported, if at all, during the first mouth. Chronic glandular enlargements which persist are usually tuberculous, no matter how good the surroundings or the general health. Syphilitic disease of the exercical glassis is relatively mre in children. It is recognized by the Wassermann test, by the evidence of syphilis elsewhere, and by the effect of treatment. In Hodgkin's disease, glandular groups in other parts of the body are involved simultaneously or in rapid succession. There are no signs of inflammation or cascation; and the swellings are usually accompanied by very marked and definite general symptoms and lood changes. Malignant growths are very rare; they increase rapidly, often attaining a great size in a few months.

Treatment.—As the tensils are so frequently the seat of infection it is important to examine these most carefully in every case. Unless it is entirely clear that they are free from disease they should be removed. Removal of tuberculum tousils is sufficient in many cases to bring about coostion of the process in the certical glands. Many begin to diminish in one shortly after tousillectomy. If it is done early in the disease suppuration of the glands is much less likely to occur. Adenced growths of the rhinopharyax and carious teeth should also receive attention.

A child from the city should be sent into the country whenever this is possible. The senside has a great reputation in such cases and no doubt the majority do very well there, but some are benefited even more by a dry mountain climate. Climatic treatment is to be recommended particularly for those children who have polmonary lesions and therefore infection with the human type of organism. Those with only tonal-lar and glandular subcreulosis do well with the removal of the focus. This should not be neglected in any case.

Drugs are of little benedt. Cod-liver oil, arsenie and iron are useful

only as general tonics. Local applications are of little value. The parts should not be rubbed or handled.

Brilliant results have been reported by Bolliar of Switzerland of treatment by belietherapy, or the exposure of the discussed parts directly to the sun's rays. This is especially to be recommended for old cases with extensive lesions, when complete removal is impossible or when operation wounds do not heal.

Operative Messures.—These are indicated, if after the remoral of the probable foci and a trial for a few months of climatic and general measures, the glands do not diminish but rather increase in size and number, or if there are signs of softening. The advantages of operation are that it leaves a clean scar which when the incision is properly made is almost imperceptible; that it shorters the disease; that if thoroughly done and the deep as well as the superficial glands are removed, it is a radical measure. The best results follow when operation is done reasonably early before the skin is involved or the glands have softened or have formed extensive adhesicus to the great results and neighboring structures; also when a chain of glands is involved and when the inflammatory process is slow or indefent. A therough operation by a good surgion in the great majority of cases will result in a permanent cure. However, the operation is not contra-indicated in cases which have gone on to a later stage, although the results may not be quite so satisfactory.

If more radical measures are for any reason impossible, glandular abscesses should be opened as soon as pus forms, to prevent the extensive undermining of the skin, which is likely to occur. The opening should be a small one, and all squeezing of the gland or surrounding tissues avoided.

As an alternative to operative measures, or when these are refused, exposure to the X-ray may be tried and in a certain proportion of cases it is rurative. The best results are seen in the early cases. The first exposures should be short, and they should be repeated not oftener than tuce a week.

Taberculia Treatment.—This has been employed extensively with a number of different preparations obtained from cultures of tubercle bacilli.* It is the general consensus of spinion that this method of treatment is of benefit, and that it diminishes the tendency to softening and promotes resolution. Our own belief is that it should not and can not take the place of operative measures.

^{&#}x27;The preparations of telecreckes must widely used are R.F. (benilles filtri) of Besyn; O.T. (original telecredia); T.R. (telecredia residue), and B.E. (benilless consistent).

The does are calculated in miligrams, it being considered that one cubic econometer of the find weight one gram, which is ready if not quite the case.

The purpose is to give enough tubependin to affect the local process, but never enough to produce a general systemic reaction-fever, malaise, swelling of the glamb, etc. It is necessary to begin with a very small dose and to increase this gradually. If there is any desation of temperature fellowing an injection, the amount should be diminished to a quarter or less of the dose given and a return made to the amount causing the reaction only after several weeks. The best indication that one has reached the point where an increase in douge is to be made with especial care, is the reaction produced at the site of injection. When this is made subcutaneously there may be around the point of injection a slight swelling, induration and tenderness for some days. Injections should be repeated every four or five days. An initial dose of .00002 mgm, is proper for an average child of two se three years. The dose may be doubled at each injection until .05 mgm, is injected. After this it is safer to repeat the same dose two or three times before increasing further and to give this dose at weekly intervals. It is not advisable to increase beyond I gut as the maximum does. The duration of treatment will depend upon the effect upon the glands. It is usually asseral months. Even when the results have been favorable it is considered advisable by many to repeat the course of treatment after an interval of some months.

HODGKIN'S DISEASE

(Pseudo-Leukemia)

Hodgkin's disease at the present time is to be considered a distinct clinical and pathological entity. For many years there was no general agreement regarding its determining characteristics and in the obler literature many cases were included which were undoubtedly not Hodgkin's disease. The condition is relatively rare. In infamey it is almost unknown, but after the age of three years it is found with increasing frequency throughout childhood. It is much more common in males. The ascential cause of Hodgkin's disease is unknown. Numerous organisms have been described in connection with it, especially modified forms of the tubercle bacillus and more recently diphtheroid bacilli. It is doubtful if the disease results from infection with any of them.

Pathology.—The chief lesion is in the lymph nodes, which become greatly colorged and in addition new ones develop during the course of the disease. Those first affected are usually in the neck, but any of the external or internal groups of lymph nodes may be affected and in severe cases the disease may involve almost every chain of glands in the body. Of the internal glands those of the mediastinum and retroperitorsul region are usually most affected. Large masses are formed

by the growth and multiplication of the lymph nodes, but even in the largest messes the individual nodes are discrete and are held together only by loose connective tissue. The sphere is usually, the liver less frequently, involved and somewhat enlarged by the formation of lymphomatons masses, which may also infiltrate almost any tissue of the body. Microscopically, the early changes in the glands consist in an increase in the lymphoid tissue. Later there is proliferation of the endethelial cells, the formation of giant cells and an overgrowth of connective tissue. The cosmophile cells are frequently present in the tissues in great numbers. The lymphomatous masses in the sphere and other organs have the same structure microscopically as the discussed nodes.

Symptoms.—The first evidence of disease is usually the swelling of one or more corvical glands. Thereafter there is a progressive involvement of other glands, though the rapidity with which this occurs may vary greatly. At the beginning the general builth remains unaffected and this usually continues until the glandular sulargement is widespread. Then a more or loss persistent fever may develop or anemia supervene or pressure symptoms make themselves evident.

The fever may be irregular, with wide excursions and periods of remission, or, what is more common, it may be only of a degree or two but periodent. The blood shows the characteristics of a secondary anemia, which increases in severity. The leucocytes may be slightly diminished or increased, but in the late stages there is usually a polymorphomoclear leucocytesis (20,000-30,000 or more). There are two constant features, an increase in the blood platelets and an increase in the transitional lencocytes. Econophiles, while usually somewhat diminished, may be present in great numbers.

These are elastic, sunctimes distinctly soft, at others, firm. They are more or less movable and not alberent to the deeper structures nor to the skin over them. At any time symptoms may appear as the result of the mechanical pressure of the glands. This may be on the cooplagus, producing dysplagus; or upon the traches or bronchs, producing dysplagus; or upon the traches or bronchs, producing dysplagus. Intra-abdominal pressure may cause jaundice or chylous ascites. In most cases enlargement of the spleen can be made out. In some instances it is extreme.

The duration of the discuse is usually less than three years, sometimes only a few weeks. There may be periods in which the progress arems arrested, but they are usually abort. Death results from asthenia, or from pressure usually upon the respiratory tract, producing slow suffocation with most distressing symptoms. The progressis is bad. We know of its children with Healgian's discuse that have recovered. Diagnosis.—The diagnosis of Bodgkin's disease may be difficult at the beginning, when only a few cornical glands are enlarged. It may be confounded with glandular tuberculosis, with lymphosareoma and with lenkemia. From tuberculosis it is to be differentiated by the wide distribution of the progressively enlarging glands; by their failure to coalesce, to exhibit inflammatory reaction or to supparate; by the frequent absence of the ren Pirspect reaction and by the more malignant coarse and pressure symptoms. Lymphosareoms is more rapid in its coarse, does not usually cause fever, the glands do not remain so discrete as in Hodgkin's disease and the spheen is seldom involved. Leukemia is distinguished by less lymphatic enlargement, by greater rapidity of progress, especially in the lymphatic form, and especially by the character of the blood findings. In doubtful cases the excision and examination of a gland will almost always give reliable information as to the presence or absence of Hodgkin's disease.

Treatment.—This is very unsatisfactory, but some remedies apparently are of temporary benefit. Assente in full doses appears to benefit some patients. The use of the X-ray has produced striking but not permanent improvement in the external glands. Recently vaccines prepared from the diphtheroid bacilli cultivated from the glands have been employed. It is too early to judge of the influence of this method of treatment. Trachestomy occasionally is employed to relieve dyspues, but is seldem indicated because the obstruction to respiration is usually situated very low in the tack or in the thorax.

CHAPTER III

DISEASES OF THE DUCTLESS GLANDS

THE SPLEEN

Weight.—From 140 observations made at the New York Infant Asylum the following were the weights recorded at the different ages:

Ace	Ouros.	Grania.
Three months Two twenths Two years Three years	16 16 16 16 17 17	7.7 15.5 23.2 38.5 46.4

Position and Methods of Examination.—The normal position of the sphere is close against the disphragm, its external surface being apposite the minth, tenth, and eleventh ribs. Its anterior border comes as far forward as the middle naillary line, its posterior border being usually near the vertebral column. In infancy it is practically impossible to autline the sphere by percussion unless it is sularged. During full inspiration the sphere is often depressed enough to be felt at the free border of the ribs, but at other times it can not be left unless it is enlarged or pushed downward by some pathological condition in the chest. Normally, the long axis of the sphere is nearly parallel with the ribs, but when the argue is much calarged, its axis corresponds nearly with a line drawn from the axillary line at the border of the ribs to the middle of Poupart's ligament.

The thin abdominal walls of young children render pulpation of the spleen much easier than in adults; and this is a much more satisfactory method of examination than is percussion. For satisfactory pulpation it is necessary that the abdominal walls should not be tense. The child should lie upon his back with the thighs flexed and the skin, of course, bared. The physician, always having taken the trouble to summ his hands, should stand upon the loft side of the patient and make pressure with the tips of the singers, which are semi-flexed. The pressure should be at first light, and gradually increased, the singers being then beld stationary during two or three respiratory novements. Under ordinary conditions the spleen can easily be felt when it is sufficiently enlarged to be of any diagnostic importance.

When moderately enlarged, the lawer border of the spleen is an inch
or so below the free border of the rule; when greatly enlarged, it forms
a tumor which may rearly fill the left half of the addomen. A tumor
in the left hypochondriac region is recognized to be the spleen, by the
fact that it is freely morable laterally and at its lower horder or extremity, while it is attached above; also its inner border can usually
be felt to be thin and sharp, and marked about its middle by quite a
deep notch.

ENLARGEMENT OF THE SPLEEN

In Acute Disease.—The sphere is most frequently and most constantly enlarged in malarial and typhood breeze, but it is occasionally so in all the acute infectious diseases.

In most of these cases the enlargement is chiefly from congestion, but there may be acute hyperplasia and an increase in size of the Malpighian bodies. It may contain small hemorrhages, and in extremely rare cases the spleen may rapture. It is generally dark-colored, soft, and somewhat friable. In the cases which recover, the splenic swelling subsides with the original disease.

In Chronic Disease.—Like the lymph nodes, the spicen is much more often enlarged in children, particularly young children, than in adults. Enlargement is seen at times in almost all the chronic diseases of early life; but it occurs most frequently in rickets, syphilis, analaria, tuberculosis, the blood diseases, and in anyloid degeneration. Besides, it may be the sent of a primary growth, either benign or malignant.

Rickets.—The splonic enlargement which accompanies rickets is generally seen during the first year; at this period it is very frequent. The swelling is usually medicate, but occasionally it is so great that the lower barder in three or four inches below the ribs.

Syphilis.—Enlargement of the spleen is one of the most constant lesions of hereditary syphilis. It is present with great uniformity in children born with syphilitic lesions, and very frequently during the active period of the disease in early infancy. It is seen at a later period during infancy or childhood, associated with other late symptoms.

Molaria.—The swelling in cases of chronic malaria may be very great.

The liver is not so often onlarged as in applialis.

Taberculosis.—It is rare to find anything more than a moderate swelling of the spicen in pulmonary tuberculosis. In general miliary tuberculosis, enlargement of the spicen is an almost constant finding. The enlargement is usually progressive, due to an increase in the number and size of the tuberculous deposits which are regularly present.

Dismass of the Bland.—Marked enlargement of the splore is found in many cases of secondary anomia. The splore is constantly smaller, and usually greatly so, in the pseudobrokemic anomia of infants, in leukenia, and in Hodgkin's disease. In the last two diseases the liver is also enlarged, but to a much less degree than the splore; in the others it is but slightly changed.

Amyleof Degeneration.—The sphere is constantly involved in amyloid disease, and the colongement of this organ, as well as that of the liver, may be very great.

Cardioc Disease.—In all forms of cardiac disease, and in other conditions in which there is obstruction to the systemic versus circulation, the sphere is enlarged. It is seen in congenital as well as in acquired cases. The liver is usually enlarged, and there may also be edema of the first or general amounter.

New-growths, Tursors, etc.—It is seldom in early life that the splem is the seat of new-growths; these are usually varieties of sarcoma, but carcinoma has also been reported.

Banti's Disease-Splenic Azemia. These are rather unsatisfactory terms which are used to designate a clinical condition which is, at

times, capable of sharp differentiation, but which pathologically has no especially distinguishing features. In the late stages, the leasons are essentially those of periportal circhesis of the love. The spleen is greatly enlarged and shows a marked accesses in the fibrous tissue both of the capable and reticulum. In the early stages the Malpighian bodies may be enlarged. In the late stages they are small and interquent.

The quest is late in chiblical, nearly not before the tenth year, and the progress is slow. Attention is generally first attracted to the anemia and the symptoms that accompany it, each as dyspusa on exertion and cardine pulpitation. The anemia has the characteristics of a secondary anemia. There is usually a moderate, relative increase of the lymphorytes. There may be from time to time slight rises of temperature and occasionally epistaxis. Physical examination shows in such instances a moderately enlarged and firm spheu. The sphenic enlargement is very slow but progressive. It is never extreme. After a time a slight increase in size of the liver occurs. The progress of the disease is very gradual. A fair degree of health may be maintained for ten or twelve years. Then there are superadded the evidences of hepatic cirrhosis. The liver diminishes in size until it can no longer be felt. There may be icterus and urobilinaria and esentually ascites with dilutation of the abdominal tems, benisteness and submiccos benorrhapes, usually occurs from some intercurrent disease before the development of the evidences of hepatic insufficiency and abstruction.

The justification for considering Banti's disease a clinical entity, distinct from cirrhous of the liver, with which the puthological findings are nearly identical, rests upon the duration of the symptoms, the disproportionately large spleen and the frequent absence of assites and interus. The course of true cirrhosis of the liver in the young is often rapid; the duration is usually a year or less. The enlargement of the splorn is generally dight, while assites often develops early and is very abstinute. Syphilis of the liver and splace may be difficult to differentrate from Banti's disease by physical examination alone, and several cases diagnosed as Benti's disease have been shown at autopay to be syphilitic in origin. The evidence afforded by the Wassermann reaction and by sareful examination for syphilis of other parts of the Body should be sought. Hemolytic jaundice may be excluded if there is no increased frigility of the red cells. In Gaucher's disease the progress is also slow and a reasonable degree of health may be maintained for many years. There is often, however, a history of overal cases in the same family: there may be a brownish discoluention of the skin; after some years the liver is also enlarged and the spices eventually reaches proportions found in no other disease.

ploved.

It has been maintained by Ranti that the spleen is the primary factor in the disease and that the liver is secondarily affected. There is hittle to substantiate this view, except that in the early stages of the disease striking benefit results from spherestomy. Sufficient time has not yet clapsed, nor have sufficient cases been recorded, to prove how permanent the benefit will be. It is clear, however, that spherestomy is indicated in the stages of the disease before serious involvement of the liver. When secites has developed pullistive treatment alone should be em-

Hemolytic Jaundice—Chronic Pamily Jaundice.—This disease is usually beneditary, but it occasionally exists in several brothers and sisters, the purents being enaffected. Similar cases may be seen without a family association. There are records of many families in which jaundice has existed through three or four generations. It is transmitted alike through the male and female descendants, and not all of the children in a family are affected. The descendants of analfected members escape. The jaundice may be noticed shortly after firth, or it may develop at any time during stabilized, sometimes not until later. This is the most straking feature of the disease. The discolaration may be very dight and intervalle only in the selectics, or the skin may be interested after intervarient gastro-intestinal attacks, which are rather frequent. When once developed, the interes never enturely disappears.

This joundice is not obstructive; the stools are usually darker than pormal and the prime contains probilin in excess, but no hile. There is an increased production of billiary pigment. The liver is normal or slightly enlarged. The spleen is regularly, and often excessively, enlarged, and even in youth there may be attacks of hiliary colic and af perisplenitis. Assenia of a moderate grade is the rule. Both the red rells and hemoglobin are reduced, and a few nucleated red cells may be found. Reticulated red calls may be demonstrated by means of vital staining. As many as 20 per cent of the total red cells may be retienlated as opposed to the normal of 1 per cent or loss. Very characteristic of the disease is the increased fragility of the red cells to hemolytic agents, especially to hypotonic sult solutions. Normal red cells are not hemolyped by solutions of sodium chlorid of a concentration of 0.5 per cent or more. With salt solutions of 0.45 per cent hemslysis begins and is complete with those of 0.25 per cent. With hemolytic jaundies benolyets usually begins with solutions of a concentration between 0.7 and 0.6 per cent and is complete with those between 0.55 and 0.45 per cent.

The growth and development of children go on unundurneed by the condition, and many affected persons have lived to an advanced age. There are no characteristic post-mortem indings. Various drugs, among them iron and arsenic, have been employed in treatment. The only effective method is surgical. Splenectory has been employed with marked improvement in several instances. In some cases, symptomatic cure has been reported. Splenectorry should be done if there is much interference with the patient's general health.

Cancher's Disease. This is a rare disease, which frequently attacks two or more members of a family, but is not bereditary. It usually begins before the age of ten years and cases have been reported in the first year of life. The most striking feature is an collargement of the sylven, which is slowly progressive and may eventually pourly all the abdomen. It is first, smooth and not tender. While never reaching the proportions of the sphere, the liver must be considerably increased in size. It is also smooth. A secondary anomia with legeopenia is constantly present but is not severy. Associated with this is a poculiar town discoloration of the skin, particularly of the face. In some instances, there is a yellowish wedge-shaped thickening of the conjunction on either side of the corner. The superficial lymph glands may be palpable, but are not materially increased in size. The general health may be fair for many years. The splense and hepatic enlargements may muse alchminal discondict and even pain, but it is rare for jamelice or assites to develop. Eventrally hemogranges may never from slight transmitten or spontaneously from the muccus membranes.

The disease may last many years. Death asually results from some intercurrent disease. While the origin of the disease is obscure, the pathological findings are entirely distinctive. Microsospically it is seen that the enlargement of the liver and spleen is due to the accumulation of characteristic cells which widely incade these organs. The cells are very large, with small executeically situated nuclei and with slightly granular cytoplasm. These cells are found not only in the spleen but also in the hone marrow and lymph glands. The accumulation in the lymph glands is not sufficient to cause market culargement, but is important as showing that the disease is a systemic one, and not primarily one confined to the spleen. The presence of the distinctive cells in the glands may be of assistance in diagnosis, as in a case reported by Knax, in which the suspected diagnosis was construed by the microscopical examination of an excised lymph node.

Medical treatment does not influence the occurs of the doesse. On a priori grounds it does not seem likely that spirmeriomy will preduce permanent cure in a discuse whose lesions are so widely distributed in other organs. A number of cases, however, have been operated upon and some have shown a distinct improvement. The time that has elapsed in the majority is, however, too short to enable a definite conclusion as to the final result to be reached.

DISEASES OF THE THYBOID

SPORADIC CRETINISM

(Athreson; Myredenston Hiera)

Since the rarly descriptions of this disease by Fagge, in 1871 and 1871, immerous cases have been published in England, on the continent of Europe, in America, and in fact, all over the world, showing that specials cretinism is not confined to any country. The condition is a relatively rare one, but in a large dispensary and hospital service one or more countiles of it are seen every year.

Etiology.—It is now well established that this condition depends apon the absence of the internal secretion of the thyroid gland. In almost all the autopoins in cases of sporadic cretinism that have been reported there has been an entire absence of the thyroid gland. Not even a trace of it has been found. In one or two instances systs have been met with in the region of the lateral realisances of the thyroid gland, or at the root of the tongue in the region of the median realisant. These systs may contain a few cells resembling thyroid tisens, but usthing that is apparently capable of functionating. There are no recorded observations upon cases of sporadic cretinism that would indicate that an already developed thyroid gland had been affected by injury or disease. The absence is due to a congenital lack of development such as produces an enceptually or the absence of other parenchymatons organs. As a rule only one case across in a family, the other members of which present nothing absorbed in mental or physical development.

There are associated no constant changes in the other ductiess glands. In the few cases in which the parathyroids have been searched for at autopsy they have been found. Alterations in the pituitary gland have been quite frequently reported. It has been found hypertropine and occasionally cyatic, but this is not constant.

Symptoms.—The symptoms of cretinism in most cases make their appearance during the second ball of the first year, but are sometimes so slight as not to be noticed until children are two or three years old. Very rarely the condition is recognized as early as the third or fourth month. The delay in the development of the symptoms is to be ascribed to the protection afforded the infant by the thyroid secretion of the mother during intrasterine life. This view is substantiated by the mre-but undoubted instances when women with either guiter or hyperthyrodism have borne infants with cretimism which was clinically recognizable at birth. Failure to grow and to develop mentally are usually the first

things to attract attention. The peculiarity of the farial expression is seen noticed. The general appearance of the cretin is striking, and so characteristic that when ones seen the disease can hardly fail to be recognized (Fig. 134). The body is greatly dwarfed, and children of fifteen years are often only two and a half or three feet in height. All the extremities, the fingers and the toes, are short and thick. With cretins of ten years of age, or even more, the relative infantile proportions



Pro. 134 -- A. Tyrrican Current Two area a Harr Yearns One. A potient in the Halsion' Haspital.



Pro. 180.—Same Partier at Sex and Open-runs Vente.

of the lody are maintained. There is almost complete lack of growth at the epophyseal junctions and there is great delay in the development of the centers of ossitionion. X-ray studies show that the nacisi of the tarsal and carpal bones may be absent until the tenth year and that the epiphyses of the long bones may not be ossified until the twentieth or thirtieth year. The subentaneous tassac occus very thick and boggy, but does not put upon pressure like ordinary edemn. The factor is extremely characteristic. The head seems large for the body; the fontanel is often open until the eighth or tenth year, and it may not be closed even in adults, leaf the crannal bones are often very thick; the forehend is low and the base of the most is broad, so that the eyes are wide apart; the lips are thick, the mouth half open, the tongue usually protrudes elightly; the checks are buggy, the cyclids thick, the hair course, straight, and generally light-colored. The teeth appear very late and are apt to decay early. The second dentition may not begin until adult life.

Fatty tumore are quite constant in older children, although ther are often wanting in infantile cases. They are seen in the supmelavioufar region, just behind the stemenuscial massic, sanctimes in the axilla, or between the scapular, and sometimes in other parts of the body. In distribution they are apt to be symmetrical, and are usually about half the size of a ben's egg. The neek is short and thick. No thyroid gland can be made out by pulpation, but a small cost may sometimes be felt at the root of the tougue. The chest is not deformed. The abdomen is large and pendulous. An unhilical hernia is almost always present. The skin is dry, perspention scanty, and cosmo is common. The voice is hourse and rough. Frequently patients may not walk until they are five or six years old, and then they waddle in a clumsy way. All the movements of the body are slow and lethargie, and everything indicates mental and physical torpor. The revtal temperature is usually subnormal. We had once an opportunity to observe an attack of acute broughtpurumonia in one of these cretims two years old. The symptoms and physical signs more typical, but during the greater part of the disease the rectal temperature fluctuated between 95° and 98.5° F. Only once was a temperature above 95° F, recorded. On account of their low temperature and torped condition these patients are very sensitive to cold. They live upon a few plane of metabolism and the energy earlings is small. The mental condition is always greatly impaired. Some are even imbecile. Cretim are dull, placid, and good-natured, rarely troublesome or excitable; and when fifteen or righteen years old they appear like children of three or four years. Speech may be impossible. The ability to say a few words is acquired late, and in some cases not at all. Almost invariably cretius suffer from constigution. At the age of pulerty there is an absence of development of the sexual organs,

Diagnosis.—The diagnosis of the fully developed condition is very easy. The farial expression, the protruding torque, the pendulous abdaneu with ambilical bernia, the fully tenses, torpor and low temperature are sufficient to characteries cretimism. The mistake is sometimes made of confusing Mongolius along with cretimism. The former may be recognized by the pocaliur formation of the eyes, the normal bone formation and growth and by the presence of the symptoms at hirth. The therapeutic test with thyroid extract in conclusive.

Prognosis and Treatment.-There is no tendency to spontaneous

improvement. If untreated, cretins may live to an advanced age, but remain dwarfs, seldom attaining a height of more than three or three and a half feet. Their mental condition remains unimproved. Treatment with preparations of the thyroid gland brings about an extraordimary change. Transplantation of the gland has been employed as well as subcutaneous injection of extracts and the legistion of fresh glandand various substances obtained from the gland. All these methods are



Fig. 128.—Dis. J. P. Wann's Coop on Complesses, Suventian Mootins one, Barone Tanameters.



Fig. 117 Arren Sex Moorms' TREATMENT SPIN THEMSEL EXTRACT.

effective, but the preparation most employed is the dried, pseudored gland, usually called thyroid extract, given by mouth. It is nearly a specific remedy for this disease. The improvement after its use is truly remarkable (Figs. 186 and 187). After a few weeks' treatment the entire appearance of the child is changed. The idiatic expression of the face is best; the thickening of the skin and subsutaneous tissues disappears; there is a marked increase in height and in the circumference of the head; muscular power is rapidly developed, so that many soon become able to walk; and progress is seen in dentition, and in some alder girls in the establishment of menstruation. Intellectual progress is much aloner than physical abanges; however, nearly all the children become much brighter and more intelligent and learn to speak.

If treatment is begun early, physical development may be apparently normal, but normal mental development we have not seen, even in cases to which treatment was begun during the first year. We have under observation several cretims who have been treated from ten to differn years. Many of these children seem quite intelligent and are able to attend school, but without exception they are much below other children of their agos in mental and neurally in physical development. As the thyroid gland is about in these potients at is necessary for them to continue taking the thyroid extract as long as they line. If it is arratted relapses occur in a few weeks, even in cases well advanced toward recounty.

Most of the thyroid extracts on the market are prepared from the glands of the sheep. A reliable extract should be given if results are to be expected. The thyroid extract of Burroughs and Wellcome we have found to be more estisfactory than many of those on the market. Of this half a grain may be given once or twice a day at first; after the child becomes somewhat accustomed to it the daily dose may be gradually increased to five or six grains. Some disturbances are often seen at the legioning of the treatment—persperation, marked irritability, and sometimes a rise in temperature—but these soon pass off. For old cases ar least five grains daily should be given for an indefinite period.

HYPOTHYROIDISM

(Infamile Myredema)

Cases of undoubted thyroid delicency are not with that differ from specialic cretinism in the time of their development and in the severity of the symptoms. Among them should be classed those cases closely resembling cretinion but not showing symptoms until the second so third year or even later and then only slightly marked symptoms. The defectory of the thyroid under such circumstances seems in extra-uterine lide or is incomplete. There are no pathological studies to show the condition of the gland and the etiological factors causing its degeneration are unknown. In a certain number of instances the condition has followed some arute infectious disease. The symptoms are those that have been mentioned under sparadic cretinism, differing only in degree. It is nearly the failure of mental or physical development that first nitracts attention; the child is morely to beam, passing that first nitracts attention; the child is morely to beam, passing

no attention to commands, is not clearly in his habits, or he is much smaller than his fellows. More rarely he is noticed to have lost the ability to do things which he had formerly acquired. The height of these shaldren is reach below the average but the degree of dwarfism depends upon the time of onset of the thyroid deferency. Some are greatly stanted, others less so; but normal growth does not occur and increase in height is very slight or absent. X-ray pictures show, as a rule, the presence of some rarpal and tareal centers of assidication

which indicate that for a time at least the thyroid has been active. The facial expression varies from the characteristic facies of cretinism to one that is only slightly expressionless, stupid or stolid. The lips are apt to be somewhat thickened, the tongue also, but by no means always protruded. The hair is often coarse and generally thick. The children are menally well neurished, often stout. The skinis dry and thickened and the subcutaneous tisse firm. Fat pads are exceptionally present. The abdomen is usually large and in the more proporneed cases there is a leenia in the umbilical region. In the less marked cases this is often lacking. The children readily complain of vold. Constipation is frequent but by natuesns the rule. Dentition is late and irregular and the second dentition delayed. The voice is menally deep and hourse,

These children are quiet and placid. Their intelligence varies according to the severity of the disease. Some are imbecile, some have quite a high degree of intelligence, so that, though several years belond their fellows, they are able



For ESS.—LAFASTING MEX-

to attend school. In the marked cases it is hardly possible to are in diagnosis. The mild cases can only be determined positively by the effect of thyroid extract upon the symptoms and especially upon growth. Thus, in one of our cases aged three and a half (Fig. 138) the height which had been stationary for some months increased nearly four inches in six months as the result of thyroid medication.

Treatment with thyroid brings about prompt improvement which will cary in extent according to the severity of the condition. Striking mental and physical improvement occurs. It is doubtful if complete intellectual development takes place. It is not to be expected that recovery of function in the discussed thyroid can occur. For this reason,

thyroid extract should be given continuously in the does advised in the previous chapter. Mental and physical deterioration occur if its administration is interrupted.

GRAVES DISEASE

(Ercphthalow Gaiter, Bandow's Disease)

Typical Graves' mouse in young children is rare. The determining cause of the perversion of the thyroid activity is unansten. Hereditary influences, especially goiter. Graves' disease and absolution are believed to play a part. Much more important is the effect of sex and age. Girls are affected three times as often as boys. As the age of puberty is approached the coors leveme much more frequent. Under fire years of age Graves' disease is almost unknown. The youngest case that has come under our observation was in a girl of five and a half years. Between two and ten years a number of cases have been reported, but after ten years it is not very infrequent.

The discuse as it occurs in childhood differs chiefly in two respects from the type seen in adult life. This symptoms develop and disappear with much greater rapidity, perhaps even in the course of a few days, and it is generally believed the outlook with the child is much more

favorable.

Symptoms.—Attention is usually first called to the disease by restteomers and contability or by the rapidity of the heart's action. Enterpersent of the thyroid may not be evident at first but is regularly present at some time during the disease. The gland is generally uniformly enlarged, sometimes to a marked degree; it is firm, often bard, and can be felt to pulsate. With improvement in the symptoms there is a marked diminution in sice, but a slight degree of permanent enlargement usually remains.

Exophthalmus is present in about four-fifths of the cases. It may
be extreme. The ocular signs of ron Stelway and ron Graefe are both
present in the majority of cases. The fine tremor so commonly present
with abult patients is usually lacking. Involuntary movements, if
present, are generally coarse involutionate movements. The skin is
often fine and most. Perspiration is readily excited, and flushing is
frequent. Pigmentation is musual. The heart's action is usually rapid
and its violence is often complained of. A slight amount of cardiac
dilatation may frequently be determined by physical examination. Nortreasures is pronounced and is in most cases an early symptom. The
distinct are constantly in motion and can be kept quiet with difficulty.
The first improvement is often noticed in a diministion of the methods.

toos. The appetite is usually fair and the digestion good, but, as with adults, the increased metabolism which accompanies excessive thyroid activity causes less of weight. Marked emacation occasionally results,

The diarrhea, so troublesome a symptom with the adult form of the disease, is coldon marked. In general it may be said that the disease is milder than with adults and that its course is shorter. It may last only a few weeks but at times remains for several years.

The prognosis is relatively good. The mortality from recorded cases has not been more than 10 per cent, while recovery is the rule. There may remain indefinitely a slight degree of exceptibilities and calargement of the thyroid and a tendency to cardiac pulpotation with tachy-cardia.

The treatment should be directed toward securing, for a time at least, complete mental and physical rest. Everything tending to excite or irritate should be arreided. It is best to remove the child from contact with other children. Prolonged warm packs may assist in producing rest and in inducing along which should be encouraged in every way. As the nervousness diminishes mild everyise may be indulged in and according to the improvement of symptoms the normal regime gradually may be resumed. Studies, school attendance and contact with other children should only be allowed after many weeks or months. and when a nearly normal condition has again been reached. The meof drugs, except occasionally, and for the relief of special symptoms, has no place in the treatment. Surgical measures are only to be considered when perlonged medical treatment has failed and when the progress of the disease is such as to threaten the life of the child. The indications for the various forms of operation are the same as with adults.

HYPERTHYROIDISM

Much more common than fully developed Graves' disease is the condition which is to be referred to a moderate increase of or percented function of the thyroid gland. To this the term hyperthyroidism is applicable. The condition is found mostly in girls and usually between the eighth and fifteenth years. Several children in the same family may suffer from the condition and it usually occurs in distinctly neuropathic children. The children are constantly active. They are apt to be irritable and cry and laugh readily. They sleep badly and complain frequently of benducte and of cardiac palpetation, especially upon exertion. Their appetite and digestion are usually good but there may be for some weeks or months moderate loss of weight and strength. A mild

degree of aremia is eften present. Physical manimation revuls in the majority of instances a eight enlargement of the thyroid gland which does not points. Exophthalmes, beyond a slight staring expresson of the eyes, is not found, and son Stelwag's and you Gracfe's some are absent. The heart's action is slightly exaggerated and rapid. Cardiac palpitation may be a cause of complaint. The hands of these children are apt to be constantly moist. The symptoms may last for some weeks or mouths. They usually disappear entirely, especially if proper measures are instituted, and in girls when menstrustion becomes established. A marked increase in the severity of the symptoms is unnoual, and the development of severe hyperthyroidism or Graves' disease from a mild form is were. The treatment is the same as for Graves' discase—rest, quiet and removal from an exciting or irrutating environment abould be provided for. Test, coffee and alcohol are to be entirely interdicted. The treatment is hygienic and not medicinal:

DISEASES OF OTHER DUCTLESS GLANDS.

A large number of conditions which cannot be classified among any of the generally recognized domains have been norribed to disturbances of function of the various endocrine or ductiess glands. It is necessary in most of these instances to assume that the disturbance is only functional since pathological changes are either entirely wanting or are recorded in an insufficient number of cases to establish a connection between the symptoms and the condition to which the symptoms are attributed.

Lesions of the pituitary gland selfom if over produce aeromegaly in children. Tumors of this gland or in its neighborhood may give rise to a group of symptoms known as "Fröhlich's syndrome," i. e., adiposity, delayed sexual development, increased sugar tolerance, and sunctimes associated mental dulmess.

Tomors of the pineal gland are in rare instances associated with presocious sexual development; tumors of the adrenals, more frequently. The exact association of the interference with the function of the glands and the presocious development is difficult to determine since the overwholming majority of pineal tumors cause no such symptoms and because experimental removal of part or all of these glands in animals does not produce comparable effects.

Polyglandular disturbances affecting two or more of the ducties plands are held accountable for many conditions, particularly the various types of infantilism. This is an attempt, in the absence of any other explanation, to ascribe a train of symptoms to a number of organs whose individual functions are largely unknown. At the present time our knowledge regarding the normal function of these glands and the results of their disturbed function is so very indefinite that it seems unsafe to meribe to them, individually or collectively, an exact clinical importance. As yet this has not been established.

The use in practice of the various glandular extracts, though prevalent and increasing, has been in our experience with most unsulisfactory results. It can, however, be definitely stated that their adminis-

tration by mouth is free from danger.

DISEASE OF THE THYMUS.

STATUS LYMPHATICES.

The term status lymphaticus is applied to a very definite pathological condition which is associated with elinical manifestations, less constant and not elemeteristic. The relation between the lesions and the symptoms is little understood, and almost nothing is known of the etiology or pathogenesis. The most striking part of the boson is the great enlargement of the thyrous gland, with which is found a hyperplana of the lymphoid thoses throughout the body, more marked than is seen in any other condition in childhood. The two most frequent symptoms are contuitions and attacks of asphyxia.

The status lymphaticus is most often seen between the sixth and twelfth months, but may be met with in children of any age. Enlargement of the thymnes to a degree sufficient to be regarded as published is not an infrequent condition. An association with reskets is often observed, but it is doubtful whether this is anything more than a coinsidence.

Since the large thymns is so important a beion, it is desirable to know what may be regarded as normal. The most extensive observations upon this point have been made by Bovaird and Nicoli, who weighed the thymns in 495 consecutive autopoise in children under the years. They found that the weight was greatest at both, the average being 7.7 grams. After this time the change in weight was very slight for the period of five years, the average for the entire 495 observations being 5.9 grams, which was about the same as the average for each of the years taken separately. Excluding cases in which the organ was so large as to be considered abnormal (10 grams or over), the average weight at birth was 5.5 grams; during infancy and early childhood, 4 grams. The results of these observations do not differ essentially from those of Fried-leben, which have been so extensively misquoted. It may therefore be

assumed that the average weight of the normal thymns at birth is from 6 to 7 grams; from birth to five years, from 5 to 4 grams. Anything ever 10 grams may be considered abnormal.

In the status lymphaticus the flynnus is often from flyr to ten times larger than normal. In the marked cases its weight is from 20 to 40 grams; in the less marked cases from 15 to 20 grams. The appearance of the calorged thymns is well shown in the assumpanying illustra-



Fig. 123.—Expansion Terrative. The basics heart, and thermas are shown in the picture. The large have been curred back, showing the two larged bases of the thyman eventagoing the heart: the curred labe, above, curren the maches. Mache g.—Prenet follows which are results odd, will developed! If two this berreby-four hours dynamic with death from applying. T. 100° F. Antopay.—Besides the large thoreast their save present the general feature of the status lymphoticus to a marked dispress. Jumps deeply composited.

tion (Fig. 139). A thymne of the size shown weighs about 45 grams, or 1] owners. In this instance it was nearly as large as one of the labor of the long. In general appearance, the enlarged thymne is rather more vascular than roomal, but other than hyperplasia, shows no constant of essential changes, either by gross or microscopical examination.

The lyngh nodes of the trachesbroushad region are greatly enlarged, often to the size of small charries, and are found in great clusters. Those

If the mesenderic region may be still larger. Peyer's patches are very prominent, and the solitary folioles of the small intestine appear like mustard seeds upon the folds of the mucous membrane. Those of the colon are also very prominent. The lymphoid tissues about the pharynt and all the lymph nodes of the body are greatly hypertrophised. The sphere is usually enlarged, with prominent follocks. There are no other constant changes. Those present are usually accidental, depending upon the cause of death.

Symptoms.—In very curly infamor this is one of the explanations of sudden death occurring after slight causes, and in some cases without any apparent cause. Beath is often attributed to overlying, to asphysia from asperation of food, or to some other condition affecting requiration, or infants are simply found dead in their cribs without evidence of anything abnormal in history or symptoms.

Even in children who live until they are several months, sometimes several years, old, there may be nothing in their condition to indicate the presence of the status lymphaticus until samething acute occurs. This may be in the nature of a slight accident, a surgical operation of a trivial character, the administration of an anesthetic, or some acute disease, frequently our affecting the respiratory tract. The symptoms associated with this condition are frequently of a nerous character, usually attacks of convulsions, or they affect the respiration, causing parioxions of despues, cyanosis, and even asphyxia. A frequent history is somewhat as follows: A child previously regarded as healthy, often well aourished and perhaps entirely breast fed, is taken with convulsions followed by high fever, preceding which there may have been some pulmonary symptoms suggesting a commencing broachopneumonia. The convulsions recur at short intervals; the temperature venuins steadily high; the signs in the lung are few and not proportionate to the other symptoms; and death occurs in from twelve to thirty-six hours often in convulsions.

In other cases convulsions are absent and the prominent symptom is asphyxia, which comes in paragraphs and may be so complete as to lead to the suspicion of largugeal obstruction. If intulation or trachesotomy is performed, no relief follows. The child may die in the first severe attack, which may be preceded for a few hours by moderate dyspines, or may come on almost without warning. It is more frequent, however, for the first attack to be less severe, the child perhaps being respectively with some effort, after which be may breathe almost as well as assume in a few hours the attack of asphysia is repeated; after several of these, each one growing more severe, death occurs. In those cases the elevation of temperature is usually slight and may be wanting.

Symptoms similar to the above but of loss severity and resulting in

recovery would suggest status lymphaticus, although the diagnosis can not be ortablished.

The cause of the symptoms is not definitely known. The asphyxia has been ascribed to pressure of the large thymus upon the large, the tracken, the precumentative nerves, or the surieles of the leart. Pressure would seem at times to be a factor in the production of the dyspnea, but apparently not the chief one. Constant dyspnea, even with a very large thymus, has never in our experience been present. It does not seem that the large thymus produces its symptoms mechanically.

There is another group of cases, perhaps the largest of all, in which there are no symptoms distinctly refemble to the status lymphaticus, and yet this condition appears to be the factor which determines the fatal outcome of what was appearently an infection or an inflammation of only moderate severity. What is seen here is simply a greatly diminished resistance to disease. In these cases it is only the autopsy which reveals the explanation.

Diagnosis.—The diagnosis of enlarged thymus is possible only by physical examination, the symptoms being too indefinite to be relied upon. In percussing the thymus the child should be placed upon the back and the neck completely extended. In some cases of marked enlargement a definite area of dishess can be made out over the base of the sternum. The X-ray is also of distinct value, the shallow being semetimes so marked especially to the right as to be conclusive. Unfortunately in many, perhaps most of the cases, both these means of diagnosis give probable results only, so that while we may suspect the condition we can not do mees. Marked enlargement of the tonsils and the adenceds exists so frequently without thymus enlargement, that this can hardly be regarded as suggesting the condition. The hyperplasia of the tracked-tendenchial or mesenteric lymph nodes or of the follicles of the infestine produces no especial symptoms.

Prognesis.—While this condition apparently may exist for an indefinite time without producing any symptoms, it undoubtedly often determines a fatal outcome of what might otherwise have been a mild illness or a trivial accident. It is especially important in connection with acute broughitts and broughopneumonia, with attacks of convulsions, with the shock of slight operations, and with the administration of anosthetics, particularly chloroform. It is one of the most frequent explanations of unexperted death from such slight causes as an exploratory puncture or even a hypodermic injection.

At present as known treatment has any influence upon the condition. There is experimental evidence that the X-ray produces involution of the thymns gland; but that it cures the condition of status lymphaticus in the human subject has not yet been established.

CHAPTER IV

DISEASES OF THE BONES AND MOINTS.

OSTEOGENESIS IMPERFECTA

(Octropiathyroni-Prepilitin Onion)

On the chickopy of this rare affection, little to known. No especial disease can be held responsible for it and the condition is not usually bereditary. It is at times, however, fromk in certain families associated with a peculiar bine coloring of the aderstics, and in such circumstances in distinctly hereditary. In affected families these children with a tendency to fractures have blue aderstics, but not all the children have this weakness of the bones. The explanation of the association is not clear.

Despite the stiological uncertainty the pathological changes are observed existence. They are found only in the boxes but are present in all the boxes, those formed in membrane as well as these formed from cartilage. The cartilage steelf is in no way affected so that the growth of the boxes in length is normal. The formation of boxe, however, both from the periodeum and in the shall, is greatly interfered with on account of deficient numbers and activity of the exteriorated with result is that the boxy trabeculae are infrequent and small. Thus the houses are thin and very fragile. No changes have been demonstrated in any of the ductions glands.

The most striking feature of the disease is the fragility of the bones—the case with which they undergo fracture. This takes place even in intracterize life, so that infants are at times born with forty or fifty fractures and with greatly distorted extremities (Fig. 110). The imports of children with osteogenesis imperfects are been dead or diseasedly after both. The bones of the shall are frequently so slightly formed that the whole cranium is soft and of a purchiment-like consistency with widely separated sutures. As the result of the numerous intracterine fractures, distinct abortening of the extremities may have taken place. Thus there may be at both a certain similarity to the configuration of chondrodystrophy. This shortening can also be made out by the X-ray; but confusion of the two is impossible for the density of the bones is always greatly diminished and multiple fractures are almost always in evidence. Any of the bones, including the ribs, may be fractured.

Those infants who survive show a greater or less marked fragility of the bones. Fracture sometimes occurs from ordinary handling which





Pr., 14th - Orman-colous Harmanicas - Numerous basisters of all the long boles. (Galant still-form of 340 forms.)

It is quite impossible to prevent, or in other instances only when a moderate degree of force is applied. Calleus formation is slight and the process of repair of longer duration than with the normal child. In exceptional instances the fragility of the benes is only manifested after several years so that there may be no suspicion of any trouble until a number of fractures secur as the result of very little traumation. Following the numerous fractures and the difficulty of backing, there is usually greater or less shortening and deformity of the bones. It may be extrome.

The progress of the dismon varies much in the different cases; in some children there is no tendency to improvement; in others, usually in those in which the fragility is considerably less, there seems to be improvement in the condition of the boson so that about the time of subserty, or shortly after, fractures do not occur except when there is the application of unusual force. There is no known treatment that influences either the severity or the course of the disease.

CHONDSODYSTROPHY

(Achondroplana)

This rather rare condition, often improperly called congenital or fetal rickets, is the cause of some of the most marked examples of dwardsm known. It was recognized as an abnormality by the early Egyptians and has figured in art in various ways since that date. Paintings above that many of the old court jesters were of this type. Because of their striking appearance, those dwarfs have always excited much curiosity and interest.

The cames of chandrodystrophy are unknown; only in rare cases has any hereditary connection been traced. The pathological process begins in fetal life and consists in a disturbance of the normal ossification of primary cartilage. It affects embedoudral ossification only, never intramembraness ossification. The flat bones, therefore, escape entirely. The vertebrae are only slightly affected while the long bones of the extremities suffer most but not equally, though the disturbance is symmetrical. The honorn and femora are almost always the seat of the greatest interference with growth. One of the most striking changes in the shall is the synostoms or early ossification of the tribusilar bone; this is formed of two parts of the sphenoid and the sphenoidal process of the occupital bone. Normally this confication does not take place until adult hife; in children with chondrolystrophy it often begins in afters. This prevents a normal expansion at the base of the skull, and



Fig. 141.—Secta in Confessionistermony, Squarmo Passersa, Passersance and Passersance, Carl via years all.

the brain, as it grows, is thus crowded appeard and forward, causing the



Pro. 142. — Normant Drvenceue Loss Roses or a Firms Contains erms most or Chistocopymorer, (Spillman.)

great prominence of the forehead (Fig. 141). The upper jaw appears very prominent on account of the depression at the root of the ness;

In the long boxes there is a marked interference with the normal proliferation of cartilage cells. This interference may be seen in all degrees. In some cases a pertoteal lamella pushes its way between the applysis and diaphysis, still further restricting the growth of the long boxes. As hone formation beneath the periosteum goes on normally, the boxes in abandredystrophy are thick as well as short.

Symptoms.—The majority of children suffering from this condition are either born dead or die shortly after lerth. Those who survive are delicate during infancy, but afterward may become strong and healthy. The most striking thing about their appear-

ance is the very short logs and arms as compared with the length of the body. At birth the arms in many cases do not reach to the wast line, and the length of the body may be less than the circumference of the bead. The epiphyses appear somewhat unlarged, the abdomen is perm-

inent, the skin of the extremities is in deep folds, the self parts seeming to be much too abundant for the shortened bones (Fig. 143). In infancy these children are often quite fat. The facial expression is characteristic. There is usually a deep depression and flattening at the base of the none, with a very marked prominence of the forebead. The head may not only some large, but by measurement may be one or even two inclus above the normal average. An erromous diagnosis of hydrocephalus is often made in the carly stage. Dentition is slightly later than normal, but not more so-than is seen in moderate rickets. Marked re-laxation of the ligaments and rather fields



Frs. 143.—Chinaneconvenires. Issuavina Faires. (Marie.)

museular power often dolay walking until the third or fourth year. If the board is large, the foundated may not close till the fourth or fifth

year. The se-called "trident hand" is characteristic. The fingers are very short and of nearly equal length, and an angular separation is seen at the second joint (Fig. 114).



Do. 144.—CHARACTERISTIC HAND OF CROSSBORGATICORY. (Missis.)



Fig. 145—A, Normally Developes Sor. Am Every Years. B. Tyrola Camppostyphonomy. Am Estation Years (Marie.)

These dwarfs are usually somewhat subnormal in their mental development but cannot be classed as defectives. They are good-natured,

often amusing, easily controlled, and frequently live to a great age. With advancing years the figure assumes a very possibler and characteristic appearance. The prominent hips, with the marked lordesis, shortened extremities, and late bowing of the legs, present a striking picture (Fig. 145). The maximum height altained is eften not more than three and a half or four feet. Although while young of feeble muscular power, later in life they often become very muscular. When adult life is reached the sexual powers are normal: if the women become pregnant, Cenarum section is almost always required on account of deformits of the pelvis.

In infancy, chondredy-trophy is often confounded with rickets, hydrocephalus, cretinism and esteogenesis imperfects; but its features are so characteristic that the mistake can hardly be made if the child is carefully examined. In severe esteogenesis imperfects the femora may be very short but the association with multiple fractures determines the diagrams. No known treatment has any influence upon the condition. The use of the thyroid extract is entirely without effect.

ACUTE ARTHRITIS OF INFANTS

The terms made proudent apportific, scale spightwills, pyemin of base, and scale astronyelitis, have all been applied to this condition. The disease is really a form of pyemia. The causes and lexions may differ considerably in the different cases, but clinically they all have certain features in common, viz., an scale joint inflammation with suppuration.

The none arthritis of infants is essentially a discuss of the first year, and is much more frequently seen in the first six months. The inflanmation may begin in the joint, at the epophyseal junction, or in the medializery canal; but, however it may start, the joint is soon invaded. The nature of the arthritis varies consented with the exciting cause. When it is due to the geneeceeus, it is usually confined to the joint; there is in most such cases a seperficial inflammation involving the synovial membrane, but rarely leading to destructive changes in the cartilage, ligaments, so henc. When it is due to the streptococcus or staphylococcus, it may begin elsewhere than in the joint, which, however, is usually soon involved, and complete disorganization may follow. It may also result in a diffuse esteonyclitis, in a subperiooteal abscess, or a separation of the apophysis. As a late result there may be a pathological dislocation or a "flail joint"; less frequently there is ankylosis.

Etiology.-The came of scute arthritis in Infants is the entrance

of pyogenic organisms into the circulation. In cases occurring in the newly born the most frequent organism is the stroptococcus, at other times the gonococcus. Less frequently are found the staphylococcus se the pneamococcus and very needy the influenza bacillus. In most cases occurring during the first two months of hife, the portal of entry is the umbilical cord, though infection may take place through the skin, conjunctiva, genital tract, or the month. In the cases developing later it is aften difficult to determine the point of only, especially when the cutse is the geoscoccus. Of 26 cases of moste geoscoccus arthritis observed in the Bables' Hospital, only 2 occurring during the first month could be classed as infections of the newly been. The cases were observed during a baspital spidemic of gonococcus vaginitis, and set 19 were in male children, in no one of whom was there any genital lesion, and in only one was there conjunctivitis. Of the 7 cases occurring in girls, only 3 had vaginitis. The portal of entry in these cases could not be definitely determined. We have also observed isolated cases of gonesoccus arthritis in the course of a gonesoccus pyemia when it was impossible to determine the mode of entrance of the organism into the circulation.

Symptoms.-General symptoms often procede the local ones. In the most acute cases the temperature is high and walely fluctuating, accompanied by other symptoms of a seven infection. The earliest local symptoms are pain and tenderness, soon followed by swelling, which may develop quite rapidly in a single joint, or in several joints simultaneomly. In those superficially situated there is reduced of the skin, and flectantion may be evident in three or four days. In cases coming on more gradually the temperature may be only from 100° to 102° F, and suppuration may not occur for two or three weeks. In the most sensor cases the progress is rapid, one joint after another being involved, with general symptoms of premia, and death may occur in a week or ten days, esually from some viscoral inflammation, porumonia, pericarditis, or meningitis. In such cases blood cultures usually show the presence of the organism to which the infection is due. In the less severe type, which is more often seen, the symptoms may last for five or six weeks. When pur is not evacuated extensive burrawing often takes place.

In Townseral's collection of 73 cases, the joints were involved in the following order; hip, in 38; knee, in 27; shoulder, in 12; wrist, in 5; ankle, in 4; elbow, in 4; small joints, in 4. In three-fourths of these cases only a single joint was affected. In the 26 generoesus cases referred to the localization was as follows: Inger or metacarpus, in 20; ankle, in 18; knee, in 17; wrist, in 12; too or metatarsus, in 10; shoulder, in 9; elbow, in 5; tempero-maxillary, in 1; hip, in 1. The average number of joints involved was 4 or 5, the largest number being

 The tendency of the generocous infections to involve the small joints is striking.

Biagnosis.—When several joints are involved, the disease is often mistaken for neute articular rheumatism, which, however, at this age is so rare that it may be ignored. Blood cultures are of diagnostic value. Syphilitic epiphysists resembles it in the localized tenderness and disability; but the rapid swelling and the severe constitutional symptoms are lacking.

Treatment.—Cold applications or wet dressings may be useful in relieving the symptoms. In some cases, most frequently when the cause is the genecoccus, the inflammation subsides without supportation. In infections due to other organisms, supportation almost invariably occurs and early free incision should be made, followed by fixation of the joint. The results depend in no small degree upon the promptness with which the pass is exacuated. In the genecoccus cases there may be complete recovery. In most of the others the functions are impaired.

The use of vaccines is to be advised in all these cases. The best results are seen in infections due to the staphylococens and next, those due to the genecucrus. In such cases, autogenous appear to have little if any advantage over stock vareines. Injections should be repeated every free or six days in increasing doses.

CHRONIC ARTHRITIS

(Atrophic Arthritis, Still's Discous)

Under the heading of chronic arthritis are probably facilided a number of chronic joint affections which as yet we are unable to separate. They all have as a sommon characteristic a crippling of the joints, not on account of primary changes of the bones or cartilages but as the result of lesions of the synovial membrane, capsule, ligaments and periarticular structures which may later cause secondary changes in the bone and cartilage. As there is no sharp line of demarcation between these conditions it is convenient to discuss them all under one healing.

Etiology.—The frequency with which those forms of arthritis begin in the young is very striking. They are often seen in children under three years of age, and the histories of those seen later often date back to this period of life. Boys are rather oftener affected than girls. While no history of infection may be obtained, in quits a number of instances the disease immediately follows or occurs shortly after some infectious disease or supparative process. Scarlet fever and measles, particularly the former, are the exauthemata after which chronic arthritis is most often seen. Demme has described, and we also have observed, very severe progressive artherits following searlet fever. The supparative process which precedes the artherits may be anywhere in the body—in the pleural cavity, the bones, the accessory nasal sinuses, the teeth or the tomoils. A history of rheumatism is not infrequently obtained. It is doubtful if at this age it is really true rheumatism, but rather an unusually neutrometer of the arthritis with fever. Hemophilia with hemorrhages into the joint may be followed by severe joint lesions, but these are quite distinct from the condition now under consideration. Nor has this form of arthritis a close connection with syphilis or universitosis.

Pathology.—Early in the disease and for a considerable time the joint surfaces and the hones are not involved. The lesion is chiefly in the synevial membrane, joint capsule, ligaments and surrounding structures. The synovial membrane is thickened; its villous processes are hypertrophied and the membrane is hyperemic and edematous. After a time it becomes thickened by the growth of new tissue. The same condition occurs in the capsule. The joint itself may contain fluid; this is usually quite clear. Later, the cartilages may be somewhat croded at their edges by the hypertrophied villi of the synovial membrane. Very tarely, and only after many years, there may be filteens or even bony ankylosis. Except for this, the only changes in the hones themselves are atrophic. They show all grades of esteoperosis.

In a certain number of instances, changes in other viscers are found. The spleen and lymphatic glands may be increased to several times their normal size, but they show nothing characteristic. The lesion is morely hyperplasia. Very rarely, without apparent cause, general amplied degeneration of the viscora is found.

Symptoms.—The onset may be scate with forer and with involvement of the joints almost coincident with the fever, or there may be swelling and articular pain and tenderness with no fever whatever. At other times there may be general symptoms for many weeks before the joints are found to be involved. We have seen one boy who had fever for nearly three months before the involvement of his wrists, which was followed uspelly by that of his ankles and knees. No matter what the mole of stoot the joints usually involved are, in order of frequency, those of the surpus and phalanges, the wrists, elbows, ankles, knees, hips and the certical spine. Barely other joints such as the stemoclavicular and the maxillary are implicated in the process. The articular lesions are usually symmetrical, but may differ in severity upon the two sides. The joints are swellen and are moderately tender to the touch; on palpation they give a somewhat doughly sensation. They frequently contain finid but usually not a large amount. The fluid may disappear and re-accumulate rapidly. The appearance of the fagers is very characteris tic, the first internlulanceal joint being the one surficet and most severely affected. The articular involvement causes flexion of the joints to a greater or less extent and this deformity increases with the progress of the disease. The pain is not great, nor is there tenderness upon pressure, but attempts to bring the joints into their normal position by active or possive motion are impossible both on account of pain and the changes in the peri-articular structures. The joints are often covered by fine, shine skin. There may be no fever whatever, and only the articular swellings. In other vircumstances, fever may be a prominent empton. There may be a persistent elevation of temperature, a degree or two above normal or for we a there may be daily concerbations and remissions of several degrees. It times the fover disappears and may be absent for months, but when it has more been a feature of the disease it is likely to return. With the fobrile form of arthritis there is usually enlargement of the superficial lymphatic glands, chiefly the inguinal and axillary. The cervical glands may also be involved and not infrequently the epitrochleurs. The spicen is often enlarged and rarely the liner also. There may be allouningree and easts in the urine. With all forms of chronic artheritis the general combition of the child suffers. There is usually a moderate degree of secondary anemia which is most marked in the febrile form. To the form of arthritis with fever and enlargement of the spicen and lymphatic glands, the name "Shiff's Esease" is frequently applied.

An examination with the X-ray shows a thickening of the periarticular structures, often distortion of the joint, and a greater or less degree of estesparasis. No esteophytes can be demonstrated.

There is a great difference in the rapidity with which crippling of the joints occurs. In one case as much damage may be done in a few works as occurs in pears in another. Eventually motion in the extremities may be nearly impossible with the joints fixed in positions of extreme deformity.

The course is usually progressive from had to worse. The crippling becomes greater and greater though the general health may remain fair. Death, in such circumstances, is due to some intercurrent discuss, very rarely to amphid degeneration of the viscera. If the cause of the discuss can be removed, the prognosis is good to far as further deformity is concerped. Even when no cause can be discovered, arrest of the discuss may occur, and at times recovery is almost complete, but this result is so mee as hardly to be expected.

Treatment.—This should always include a careful search for anything that might act as an eliological factor. Especially should septic processes in the tensils, in the accessory sinuses and in the toeth be

sought. Unless the cause can be removed, treatment is merely pulliative. The patient should be placed under the best hygienic conditions with as much life out of doors as possible. Apparatus should not be were except to prevent deformity and to assist in walking.

TUBERCULOUS DISEASE OF THE PONES AND JOINTS.

The chronic forms of interculous lone disease, on account of their insidious onset and the frequency with which they simulate other diseases, more frequently fall, in the early stage at least, into the hands of the physician than into those of the general or orthopedic surgeon. All that will be attempted in this chapter will be to outline in a general way the most important forms—viz., disease of the vertebrae, hip, and knee—dwelling particularly upon the early symptoms and diagnosis. For their fuller discussion, particularly as to the details of treatment, the reader is referred to tent-books on general or arthopedic surgery. The causes are the same, and the losions are very similar in all forms, and will therefore be considered together.

Etiology.—The age at which tuberculosis of the bones most frequently begins, is from the third to the eighth year, it being comparatively rare before the end of the second year. The sense are affected with about equal frequency. Tuberculous bone disease may occur in a child who has previously been in apparent health, but more often in one who has been reduced by some previous illness, especially one of the infortions diseases; of these, it most frequently follows measles and whospingcough. Of seventy-one cases in children investigated by Park and Krumwiede, or collected by them, the bucillus was of the human type in sixty-eight and begins in but three instances.

A family history of tuberculosis is present in a large number, but by no means in a majority, of the cases. Like inferreducis of the certical glands, it is rarely preceded by other tuberculous processes, although it may be followed by them. It usually appears as an example of primary infection; but it is quite impossible that such should actually be the case. There has previously been a latent focus of tuberculous elsewhere in the body. In many cases discuss of the branchial glands has been demonstrated by autopsy. Infection from these or from other tuberculous lymph glands is the most frequent point of origin of infection in cases of bone discuss.

Traumation is often an exciting cause, and it may determine the site of the discuss.

Lesions.—The tuberculous joint diseases of childhood are, at a rule, secondary to disease of the bones. Hip-joint disease usually begins in

the head of the femur, and knee-joint disease in any of the condyles; ankle-joint disease in the lower epiphysis of the tiles, etc.

The frequency with which disease is seen in the different heations is shown by the following table, which gives the number of cases of each form applying for treatment at the Hospital for Ruptaned and Crappled, New York, during ten years:

Spine.	2,145	care,	ce	37.5	per	cest.
Hip				34.0	90	
Knee.			*	21.5	20	
Ankle or tuesus	25.5			4.5		
Ebov	71		*	1.2		
Wriet.	30		*	00.9	*	
Shockler	.24	1.5	-	0.4		
	-			_		
Total	5,704		-	0.00		

The character of the hone disease upon which chronic joint disease depends is generally a primary outitis, which affects the articular estremities of the long bones, usually beginning near the minkysul line; in the short hones it is a central ostitis. The stages in the process are, conjection, swelling, and cell inflittation, followed by casestion, and frequently by softening and suppuration. In the early stage, the hone is slightly enlarged, and on section one or more yellowish feet of disease are seen. The disease may be arrested in this stage, meapsulation of the inflammatory products taking place; or it may continue until there is a more or less extensive breaking down or disintegration of the affected bone. As the disease extends there are involved the periasteum, the articular cartilage, and finally the joint itself. Aboves may form in the joint or in the soft parts surrounding the bone. The process is quite analogous to tuberculous disease of the lung. As the disease advances ligamentous attachments are loosened, and displacement of the parts occurs with the production of deformity, due partly to muscular contraction and partly to the weight of the body. The inflammatory pewess, with its resulting disintegration, generally goes on to a certain point, where it is arrested. Gradually the broken-down bone substance is separated and thrown off in small particles in the discharge, and a reparative process begins, with the formation of healthy hone. Where joint structures have been destroyed, cure takes place by bony anaxiosis. Sometimes the disease finds its way to the surface without involving the joint; at other times the disease may be arrested, and its products become encapsulated within the bone. Inflammation of the joint may occur by a gradual extension of the inflammatory process, or by a andden perferation of the articular lamella. As a result of extensive disligaments, articular carrilages, and the cellular tissue surrounding the joint. The process of disintegration and that of repair are both very chronic and measured by months or years. The entire course of the disease is from one to ten years, three years being about the average duration. In the great proportion of cases but one joint is involved, although it is not infrequent in hospitals to see two, three, and sometimes four of the large joints affected in the same patient.

Secondary Lesions.—Absresses form in a considerable proportion of the cases, and aften burness a long distance before they reach the surface. Amyloid degeneration of the liver, splem, and kidney, and sometimes of the intestines, occurs as the result of the prolonged supportation, chiefly in connection with disease of the hip or spine, occasionally with that of the knee. General or localized inherculosis, particularly tuberculous

meningitis, may develop at any time and prove fatal.

Caries of the Spine-Polt's Disease

This consists in a tuberculous inflammation of the bodies of the vertebrae, asually beginning in the central portion and extending to the periosteum, ligaments, cartilages, and, in fact, to all the contiguous structures. Secondarily it involves the membrance of the cord, the rosts of the spinal nerves, and even the cord itself. The number of vertebrae usually affected is from two to five. The gross appearance of the lesion in a well-marked case is shown in the accompanying cut (Fig. 146). After the bodies of the vertebrae have become softened and partially broken down by disease, the procure from the superincumbent weight of the body causes them to fall together and produces a backward displacement of the spinous processes, giving rise to the deformity known as kyphosis, which in its extreme form is popularly known as "hunchback."

Any part of the vertebral column may be affected; but the disease is next frequent in the dersal region, as shown by the following statistics from the Hespital for Euptured and Crippled: Of 2,143 cases, 72.5 per cent affected the dersal region, 15.3 per cent the lumbar region, and 18,2 per cent the certical region.

Symptoms.—The conset is gradual, often insidious, and the early symptoms are frequently overlooked or misinterpreted. The case may go on for weeks or even months before the true nature of the disease is recognized, which is often not until deformity has occurred. In tearly all cases, however, the early symptoms are sufficiently characteristic to enable a careful observer to make a diagnosis before the stage of deformity.

The most constant early symptoms are: (1) pains caused by the

irritation of the surve roots and referred to various parts of the body, following the distribution of the spinal nerves; (2) rigidity of the spine from muscular spasm, this being an attempt to present motion at the sent of discuse; and (3) the assumption of various postures calculated to relieve pressure upon the discused vertebral bodies. Sometimes the first symptoms are those of pressure-paralysis; at others they are the local signs of abscess. In addition to the local symptoms mentioned, there is usually disturbed sleep, often accompanied by meaning



Pro 146.—Perri's Disease or true Urran Donate Reserse, A vertical section of the spine, showing diinfegration of the bodies of the vertebrae and enercorlamont upon the spinal canal. (From a partient dying in the Hospital for Ruptured and Cripplet.)

Certical Discuss.-The pains are often felt above the point of disease, frequently in the form of occipital neuralgia; sometimes they are referred to the front or the side of the neck. They may be so frequent and to severe that the face assumes a constant expression of anxiety or distress. In other cases pain is excited only by an attempt at movement. The muscular spasm most frequently takes the form of slight terticollis. sometimes of slight opisthstonus; sometimes there is simply a fixation of the head by a tonic spasm of all the muscles of the neck; both active and pussive motion is resisted. and any movement may be so painful that the child involuntarily steadies his head with his hands. These symptoms come on gralually and are persistent. Sometimes they are overlooked, and the limit thing to attract attention is a progressive weakness in the lower extremities, which proves to be the beginning of paraplegia. Occasionally the first marked emptoms are those due to the formation of a retropharyngeal or a retro-esophageal absess.

The deformity from certical disease devolops much later than when the disease is

located elsewhere. Usually the neck appears broadened or thickened in a nearly uniform way, and often the bend seems to have settled downward upon the shoulders. In the lower cervical region a hyphosis is not infrequent; but in the middle and upper regions there is more often an anterior pronunctice, which may be felt in the posterior wall of the pharynx.

Dersal Disease.—The referred pains are now below the seat of disease, and take the form of intercostal neuralgia or pain in the epigastrium or the abdomen. They are often ascribed to cold, malaria, indigoation, or worms. There is a disposition to assume the procee position while absence, and also to lean across a chair or the hip of the nurse. The child walks excefully, holding the spine erect and very stiff, and exhibits great caution in getting into or out of bod, or in rising from a recumbent position. In the beginning there may be a slight lordesis, or forward curve at the seat of disease, instead of the usual hyphosis or backward projection, but the latter soon takes its place, and with it is seen the compensatory brelows in the lumbar region.

Lumber Discour .- The first symptoms here are often pain and lameness, referred to one of the lower extremities. This frequently leads to the suspicion that the hip is the sent of disease. In addition to the lameness there may be a tilting of the pelvis to one side, and cometimes quite a dictinct lateral curvature of the spine. Beforved pains are not so frequent nor so severe as when the upper part of the spine is affected; they may be felt in the grain, in the born, in the thigh, in the battock, or in the hypogastrium. The gait and attitude are very characteristic: Throwing the shoulders well back, the patient walks stiffly, with short steps, holding the spine with the greatest care. He rises from the floor awkwardly and with difficulty. Deformity is not usually so early nor so marked as when the discuss is dopal, and often before it is visible there are symptoms due to the formation of peops abscess-lameness, flexion of one thigh, and a tunne deep in the iline force or at the upper and inner aspect of the thigh; in both locations it has often been mistaken for Bernia.

Physical Exerciselies. Whenever any of the above symptoms are present, the child should be stripped and submitted to a thorough examination, the purpose of which should be to determine, first, the existence of any deformity; secondly, the mobility of the spine; thirdly, the presence of any accordary losions, such as aboresses or paralysis; The mobility of the spine is best determined by studying the attitude, gait, and posture of the shild, and the manner of stooping or rising from the floor. The gait has already been described with the symptoms of lumber disease. As it has been aptly put, "the child walks with his legs, but not with his back." In stooping, the same disinclination to bend or move the spine is seen. It is often impossible to induce the child to stoop at all, and when he does so, to pick up some object, there is arsite flexion at the knee and hip, but no little bending of the spine as possible. In rising from the recumbent position the same thing is seen The posture and attitude of the child will be modified by the position of the disease, and somewhat by the activity of the process at the time; however, by comparing the movements referred to with those of a healthy child, the great difference will at once be apparent. If the symptoms point to corvical disease, a digital exploration of the pharvax

for deformity or abscess should be made, and the extremities should be examined for paralysis. If the discuse is in the lumbar region, deep pulpation of the illue foom should be made to discover a prosabscess, and the passive novements of the thigh should be carefully tested to determine whether there is any resistance to extreme extension, this often Ising present before the pross tumor. No matter how clearly the languages may be at the hip, it should be remembered that this often results from disease of the lumbar space. If the thigh is flexed and freely movable except in extension, the symptoms are probably the result of psons irritation, for in hip-joint disease the other movements of the joint are also resisted.

The deformity of Pott's disease is often spoken of as "angular" curtature of the spine. While this is a true description of the disease at an advanced stage, there is often in the early stage only a general curve. Later a slight knuckle is seen from the unnatural projection of a single spinous process. This deformity may increase and finally involve five or six vertebrae. It is assully greatest in the upper dorsal region. A slight prominence, which does not disappear on suspending the patient, is always suspicious.

Tenderness upon pressure over the spinous processes and increased sensitiveness to heat and cold are rarely present. Pain may sensitives he produced by downward pressure upon the least or shoulders in the axis of the spine. This symptom is not necessary for diagnosis, and the attempt to elicit it is strongly condemned by Gilmey, who has seen serious harm follow such a test.

Course of the Disease.—Caries of the spine is a very chronic disease, its course being measured by months or years, but marked, as in all chronic disease, by periods of remission and exacerbation. An exacerbation may follow transaction, and is often accompanied by the formation of an abscess. After the disease has lasted from one to three years, the destructive inflammation neually ceases and repair begins, a cure being finally effected by a process of consolidation of the fragments of the diseased vertebrae, and the production of ankylosis. Relapses are easily excited by transactions, by improper treatment, or by discontinuing the use of mechanical supports before the disease is quite arrested.

Absence.—The frequency with which absences occur depends somewhat upon the treatment. Townsend states that of 280 cases, absence was present in twenty per cent. They are rarely seen earlier than three or four months from the beginning of symptoms, and usually halong to the second year of the disease. They cometimes form with acute symptoms, but more frequently they appear as typical cold absences. Those connected with cervical disease are retropharyngeal or

retre-esophageal, or they may open externally, usually just above the clasticle, in front of the sternomostoid muscle. Those with disease of the lower cervical and upper dereal vertebrae are apt to learnest along the spine, appearing in the lumbar region; rarely they may repture into the esophages or the plearal cavity. Those with disease of the lower dereal or lumbar vertebrae may open just above the illuse creek posteriorly, or burrow anteriorly between the abdominal muscles, but the usual course is for them to follow the poors muscle, appearing in the groin just above Poupart's ligament or at the upper and inner aspect of the thigh.

Paralysis occurs in about one-half the cases in which the disease affects the lower cervical and upper dereal vertebrae, but it is rare when the disease is below the middle decad region (see Compression Myelitis).

Progressis.—The actual mortality of Pott's disease is difficult to state, so many of the consequences of the disease being remote and not fully appreciated until adult life is reached. The general mortality from all enuses is from ten to twenty per cent. The causes of death are schaustion from prolonged suppuration, amyloid degeneration, myelitis, general tuberculous, and tuberculous meningitis. Sudden death occasionally occurs from pressure upon the surd in the upper cervical region, or from the pressure offects of abscesses in the posterior plarynx or in the posterior mediastinum.

The prognosis as to the amount of permanent deformity will depend upon the seat of the disease, the time at which treatment is begin, and upon the thoroughness with which it is carried out. The best results as to deformity are obtained when the disease is below the middle dorsal region. With improved methods of treatment begun early, a large number of these patients recover with an inorganificant amount of deformity, and some with none whatever.

Diagnosis.—The spinal deformity resulting from Pott's disease may be confounded with rachitic hyphosis or with rotary lateral curvature. Bachitic curvatures are usually seen in children under eightoen months of age, a time when Pott's disease is rare; there are other signs of ricketa present, and instead of rigidity there is usually under mobility of the apine. What is true of rickets may be said of all curvatures depending upon malnutrition. In young children, especially, the tuberculin test is of considerable assistance in diagnosis.

Botary lateral curvature is seen about puberty, rarely in young children except in connection with rickets. A slight lateral deviation of the spone, semetimes seen in the early stages of carries, may resemble a case of incipient rotary curvature. The latter is not attended by pain or rigidity, and is most frequent in young girls from eleven to fourteen, years of age. Other abscesses may be mataken for those dependent upon vertebral caries. This difficulty is likely to exist in the cases attended by very little spinal deformity. Those abscesses are most frequently in the iline fosse or in the lumbar region, and may be due to perinephritis or appendicitis. The latter are more acute than those depending upon bone disease and usually accompanied by fever. Tumers of the vertebrae or of the spinal cord may give rise to symptoms almost identical with those resulting from compression myelitis due to Pott's disease. Both of these are may (vide Tumors of the Cord).

Treatment.—The treatment of Pott's disease is both general and local, and norther should be neglected. The constitutional treatment should be similar to that employed in other forms of tuberculosis. The local treatment belongs to the domain of orthopolic surgery.

Articular Ostilia of the Hip-Hip-Joint Disease

In early childhood this generally begins as a chronic ostitis in the head of the femor, starting near the epiphyseal line. Exceptionally, and oftener in older children, it begins in the acetabulain. The pathelogical process, as well as the clinical hostory, is generally described as consisting of three stages. In the first stage—that of ostitis—the below are limited to the bone; in the second stage—that of arthritis—all the joint structures are involved, and in this stage suppuration usually secure; in the third stage there is breaking down and absorption of the head and sensetimes of the neck of the femor, which, with destruction of the ligaments, leads to marked displacement of the parts from muscular contraction. The discuss may be arrested in the first or in the second stage, or it may continue through all three stages.

Symptoms.—Clinically, the usual duration of the first stage is three or four months; it may last only for a few weeks, it may extend over two or three years, and the disease may be arrested in this stage. The caset is usually very gradual, and the symptoms are often considered of trivial importance ustil they have continued for some weeks. Generally the first thing noticed is slight lameness, this to stiffness of the joint. In the beginning this may be seen only in the morning, wearing off during the day. It may be accompanied by some tenderness about the hip and a discollination to walk. A little later the child complains of pain, which is most frequently referred to the front of the knee or the inner aspect of the thigh, but only in rare cases to the hip itself. This is slight at first, but gradually increases in frequency and severity, and soon there are added the "starting pains" at night, which are one of the most characteristic features of early hip disease. These pains are produced by a sudden spasm of the muscles during sleep. The child often cries out

sharply without waking, semetimes wakes with a cry; this is often repeated several times during the night. Seen restlessness and fretfulness during the day are present. The lanceness, which at first was slight and occasional, or noticed only in the morning, comes to be a constant symption, and week by week increases in severity. The evolution of these symptoms may take only a few weeks, but semetimes they come and

go in the most inexplicable manner during a period of several months, or even one to two years, before they are fully developed.

Every child with a suspicious lameness, or with pains like those mentioned, should be stripped and submitted to a thorough roansinstice. The first points to be abserved on inspection relate to the general contour of the hip; every perminence and depression should be carefully noted. Then the attitude and gait should be studied; and finally all the functions of the joint should be carefully tested, and the limbs measured, to determine the existence of shortening or atrophy. At every step a comparison should be made with the sound limb. The contour of the hip is changed quite uniformly; there is broadening and flattening of the whole gluteal region; the trochanter is nanaturally prominent; the gluteal fold is shortened, and often single instead of double. There is no characteristic position of the limb in this stage. There is, atrophy of the thigh and often of the calf In Fig. 147 is shown the appearance of a typaral case in the full development of the first stage. In walking, the child favors the diseased side, throwing the weight as much as possible upon the sound limb; but all these symptoms are of much less importance for diagnosis than is an examination of the functions of the joint.



Fro. 147.—Hir-Joney Diseases, Ar the Est or the Finer State. Showing manular simpley, preminence of the trochaster, flatters ing of the globest region, and a single glatest fold.

For this purpose the child should be placed upon a table upon his back, and the various recoverents of the hip—abduction, adduction, flexion, extension, and rotation—should be executed, first with the sound limb and then with the suspected one, the two being carefully compared at every point to determine the degree of motion allowed. It is not necessary that force should be amployed or pain inflicted. If the

symptoms have exteted for some works, there is generally a limitation of motion at the hip in all directions, but first usually in addaction, rotation, or extension. In more advanced cases, no motion whatever may be permitted at the joint, the pelvis tilting with the slightest movement of the fermer. This fixation of the hip is due to tonic muscular spasm. Crowding the articular surfaces together, by pressure upon the heel or trochanter, produces pain, which is usually referred to the joint. This test should be carefully neede, lost injury be inflicted. Examinations should not be made under other, since in this way serious injury may be done unconsciously.

Second Staye,-This has been called the stage of arthritis. Its existence may be assumed when the limb takes the position of marked permanent deformity, which is due at this period to muscular action, not to destructive bone changes. The transition from the first to the second stage is in most cases a gradual one, and the line between the two can not be sharply drawn; sometimes, however, it is rapid, and nurked by a sharp exacerbation of all the symptoms. This may indicate a sudden perforation of the joint and the rapid development of suppurative arthritis. Such is the neual result when an abscess which has been slowly forming in the hone opens into the joint; or acute joint inflammation may be lighted up without so evident a cause. Sometimes the pus reaches the surface below the capeular ligament, and the joint remains intact. An arute exacerbation is indicated by increased pain, excessive tenderness about the hip, often by inability to walk, or even to bear any weight upon the limb, and frequently by fever. The position assumed by the limb is now fairly characteristic. The fost is generally everted, the thigh slightly flexed and rotated outward, and the limb apparently lengthened. There may be infiltration snywhere about the hip, due to the formation of an abscess. The muscular spasm is so great that the joint is locked-no motion whatever being allowed. Abscusses may form at any point about the hip; they are especially frequent at the upper and outer aspect of the thigh, and may burrow long distances before reaching the surface. The duration of the second stage also is indefinite, but it usually lasts from a few murilla to a year, or the disease may be arrested in this stage.

Third Stage.—There is now marked deformity, which is the result of massular contraction after absorption of the head and sometimes the neck of the femue, and destruction of the ligaments. The position of the limb is a very constant one, and resembles that present in dislocation agen the dorsom of the ilium. There is shortening of from one to four inches; the thigh is strongly flexed, adducted, and rotated inward, and the foot is inverted; the trochanter lies against the outer surface of the ilium, and is above Nelaton's line. In this position the joint may become ankylosed. The displacement usually comes on gradually, but it is sometimes so sudden as to be mistaken for a true dislocation, although the latter is exceedingly rare in the course of hip disease.

There is now marked atrophy of all the muscles of the limb, and the thigh may be two or three inches smaller than its follow. No motion at all is usually allowed at the hip, but this is compensated for to some degree by the enaggerated mobility of the lumiar spins. The spinal curvature—lordosis—is very marked both upon standing and walking. The duration of this stage may be several years. From time to time cancerbations occur, often excited by falls, and accompanied by the formation of new abscesses. In protracted cases, all the soft parts about the hip may be seamed with electrices from old sources. After the discusse has gone on to the third stage, cure can take place only by ankylosis.

Diagnosis.—The important point in the early diagnosis of estitis of the hip, is the gradual evolution of the symptoms, the most characteristic of which are lameness, "starting pains" at night, and impairment of all the functions of the joint. Mistakes in diagnosis most frequently arise from a failure to obtain a careful history, and from relying too much upon the symptoms of lameness and deformity. The essentially chronic character of the disease should constantly be borns in mind. In the tast majority of cases, with a careful history and a thorough examination, there can be but little doubt as to the diagnosis except at the very outset. The proportion of obscure and irregular cases to those following the regular course is small.

In the early stage, hip-joint disease may be confounded with a strain of the joint, with muscular rheumatism, polismyelitis, perioritis of the staft of the fener, phicomorous inflammation in the neighborhood of the joint, or with carios of the lumber spins. In the second stage there is even less difficulty in diagnosis, although abscesses resulting from perinciphratis or appendicitis have been mistaken for those arising from hip disease. In the third stage, a mistake is almost impossible.

Progressis.—This is to be considered both with reference to life and limb. The records of the Hospital for Ruptured and Crippled show the mortality of hospital patients with hip disease to be nearly twenty-five per cent. This includes deaths directly or indirectly traceable to the disease. The causes are nearly the same as in carries of the spino-exhaustion from prolonged suppuration, amyloid degeneration, and general tuberculosis or tuberculous meningities.

Under the most favorable conditions, the disease may be arrested in the first stage, and recovery occur without lameness or any noticeable impairment of the joint functions. This result, however, is not often stained, because the disease is usually well advanced before it is recogmand, or because of the difficulty in the way of carrying out all the details of treatment in the best possible manner. If the disease has advanced to the second stage and suppuration has scentred, there always results some impairment of the joint functions; usually there are decided lameness and marked morniar already, but very little shortening or deformity, provided the limb has been kept in the proper position. If the disease has advanced to the third stage, there are always marked shortening, deformity, and lameness.

Treatment.—The indications for constitutional treatment are the same as in caries of the spine. The purpose of Iocal treatment is to secure constant and complete rost for the discussed parts, and to prevent deformity. It should be in the hards of an orthopedic surgeon.

Articular Octilis of the Knee-Knee-Joint Discuse-White Swelling

Ostitis of the knee usually begins in one of the condyles of the fomer, the inner much oftener than the outer one; less frequently it begins in the head of the tibis. The pathological process is very much like that at the hip. There is in the first stage a control satistic accompanied by infiltration and expansion of the part of the hose affected. The disease may remain limited to the bone, the inflammatory products becoming encapsulated, or softening and breaking down may occur, with the formation of an abscess. Gradually the process extends outward, and the periosteum and the soft parts are involved. The disease may invade the joint itself in a destructive inflammation, or pus may escape externally without seriously involving the joint structures. The degree to which the joint is involved varies much in different cases; there may be only a simple synoritie, a suppurative arthritis, or a destruction of the cartilages and articular ends of the bones, synovial membrane, and ligaments, so that in the advanced stage all traces of a joint structure are lost.

If the process remains limited to the bone, recovery may take place with very little impairment of the joint functions. If supparation in the joint has taken place, there will be more or less stiffness and fibrous or bony ankylosis. When there is distruction of the ligaments and articular ends of the bones, the limb assumes a characteristic position—the joint is fiexed, the tibia is displaced luckward and retated outward, and there is marked over-riding of the femur. Bony ankylosis in this position is often seen.

Symptoms.—The carliest symptoms of discuss at the lense are usually a slight stiffness of the joint, with a disposition to flexion and slight lameness. At first these symptoms are noticed only occasionally; finally they become constant and there is pain, which is usually referred to the knee. In some cases there are "starting pains" at night, although these are less constant and less severe than in hip discuse. Swelling is noticed early, as the diseased parts are superficial. At first this is chiefly of the bone itself; the conduct monthly the inner one, is sularged and slow gated, often to a marked degree, before there is any infiltration of the soft parts. Later there is a general funderm swelling, involving the entire joint and efficing all the normal outlines. Some tenderness upon pressure over the hone affected is present quite rarly, and there may be atrophy of the muscles of the thigh and calf. The knee is flexed and slightly rotated outward, the position which secures the most complete relaxation of the joint structures. In some cases there is seen the characteristic swelling due to distention of the synorial membrane. Abseesses may form anywhere about the joint; very frequently they burrow beneath the lenden of the quadricers extensee no far as the mobile of the thigh. Gradually the deformity increases until the leg may be ficzed at a right angle, and retated outward over an arc of twenty or thirty degrees.

The course of the disease resembles that of actitis of the hip and the spine. During periods of remission pain and tenderness often subside for several mentils so completely as to lead to the supposition that the disease has been arrested. An converbation is often excited by a fall or a strain of the joint, or it may follow an attack of neute illness. The disease may then progress rapidly and abscess after abscess form, with extensive destruction of all the joint structures and the production of permanent deformity.

Prognesis.—The danger to life is considerably less than in disease of the hip or spine. Death, however, results from the same ranses—exhaustion, anyloid degeneration, and general interculous or interculous meningitis.

With an early diagnosis and proper treatment the discuse may, in a considerable proportion of cases, remain limited to the bone, and the resulting lameness and deformity be very slight; but otherwise a certain amount of lameness results from the staffness of the joint. This may be due either to libeous thickening or to bony ankylosis. Nearly all patients are able to walk without crutches, and if proper treatment has been carried out there is neither marked shortening nor deformity, although there is always great muscular strophy.

Diagnosis.—The important symptoms for diagnosis are the gradual onset, the early swelling which is due to enlargement of the bone, and the constant lameness and deformity. The disease may be confounded with rheamatism, with sympositie, and oven with sourcy. In all these cases the resemblance exists only during the period of exacerbation. A careful history, however, will usually make the diagnosis clear. Treatment.—The general treatment is the same as in other forms of joint downse. The indications for local treatment are the same as in hip discuse.

Tuberculsus Ostromyelitis

This disease is rarely seen except in the short fulular bones, most frequently those of the hand and fagers. From this fact it is often called zerafatous or tuberculous decialitis. It is described by many writers under the name of spins reafour. Unger gives the following figures dowing the frequency with which the different bones were alfected: fingers in 43, less in 3, metacarpus in 41, metatarsus in 14, radius in 2, ulus in 2, trhis in 3, jaw in 3. The first phalmer of the index linger is the hone which is most frequently the scat of disease. In the majority of cases the process is confined to a single hone, although it is not rare to see five or six affected. In such cases the disease is selden symmetrical. The process is a chronic inflammation, beginning in the center of the bone with the deposit of tuberculous material. The swelling which follows causes an expunsion of the bone and thinning of the shaft, until a mere shell may remain. The later changes are inflammation of the periosteum and the soft parts, the formation of absresses and sinners, pecrosis, the exfolintion of sequestra, etc. The entire disease tasts from one to three years, and causes in most cases marked deformity.

Tuberculous dartylitis is essentially a disease of early childhood, being seen most frequently during the second and third years. The disease frequently appears to be the only tuberculous lesion in the body, but tuberculous of other parts, especially other hones, may be associated.

Symptoms.—The discuss usually begins as a painless enlargement of one of the phalanges, most frequently the first one of the index flager. It may be two or three angullas before it is of sufficient size to attract much attention. Exceptionally the inflammation is a more active one, and is accompanied by both pain and tenderness. The swelling is quite -haracteristic; it is smooth, hard, uniform, and generally spindleshaped, involving the entire phalanx of the affected fager. The appearance of a severe typical case is shown in Fig. 148. Later there is discoloration of the skin, and usually there is supportation. The abscess generally opens at the side of the finger, and a currly pas is exacuated. If the opening is enlarged by an incision there is found a cavity partly illed with caseous matter, and dead bone is felt, and verbage a loss sequestrum. The cavity is surrounded by a thin shell of new bone, which is formed from the periestemm. If no operation is done the discharge continues for weeks or months, other abscesses often form, and finally several small sequestra are exfoliated-sometimes a single large one-which is the shell of the diseased phalanx almost setting

In some cases the disease is arrested hefore necrosis occurs, but in the inalority this is not so. After the wounds have all healed the finger remains shortened, deformed, and often necless. In some cases the disorganization is so extensive that ampulation is necessary.

Diagnosis.—The recognition of dactylitis is usually easy, but as symptoms almost identical may be seen in a syphilitic inflammation, it is often difficult to tell with which of the two forms one has to deal. The tuberculous form is much more frequent and is usually seen in children over two years of age; it may occur in a patient with tuberculous antecedents, or it may be associated with other tuberculous



Do. 168.-Tunescupous Decreams.

letions: Syphilitic dartylitis is distinguished by the fact that it is more often seen in young infants, that the lesion is more frequently multiple, that it is often symmetrical, and that other manifestations of applicate are generally present. The Wassermann and the tuberculin tests give definite information in nearly all cases.

Treatment.—Painting with indin and like measures are useless. The diseased part should be kept at rest—if a farger, by the application of a spirit. Every means should be taken to build up the patient's general health, as this is the most effective way to influence the local process. The general verdict of surgeons is against early excision as a means of arresting the disease. Absences should be opened early and freely, all diseased hone removed, the farger kept in proper position, and the wound treated according to general surgical principles. Under almost any treatment the disease is a protracted one, and rarely lasts less than a post.

CHAPTER V

DISEASES OF THE BKIN

This skin at both is covered with a whitish achaecous secretion, the versix casessa. The skin itself is of a deep-purplish color, which changes to a bright red over the face and trunk in a few minutes, with the establishment of normal respiration, and in a few hours the whole lastly has the same tint. This accessive reliness slowly fades during the first month, at the end of which time the skin has assumed the pule pink of mlancy. On the third or fourth day there may be seen the first signs of physiological interes; this generally disappears by the end of the second week.

The epidermie which is present at birth soon loosens and is thrown
off. This normal desquaration neually begins upon the fourth or fifth
day, and is completed in ten days or two weeks. If the skin is frequently oiled and properly taitled, desquarantion is scarcely noticeable
unless a close examination is made. In more infants, especially those
who are delicate and suchectic, it is very much more marked.

Perspiration is rarely present before the end of the fourth menth, and is then seen only upon the forehead. In Scalthy infants it is searcely noticeable during the first year. Copour perspiration is most frequently a symptom of rickets; less marked perspiration may occur with any general weakness or during neute illness.

CONGENITAL ICHTHYOSIS

Congenital, or more properly fetal, ishthyons in its savere form is a rare disease, characterized by the formation, usually all over the body, of a thick, horny epidermis resembling parchment. This is divided by fiscures or shallow furrows into irregular patches; sometimes these are two or three inches wide, at others as small as a pin's head. In its milder form it is not uncommon. The disease begins in the early mentles of fetal life, and is an almoratality in the development of the skin, these being an excessive proliferation of the layers of the epodermis.

Symptoms.—In the gravest form of the disease the child often lives but a few hours, and tarely more than a week. The openings of the nestrile and the ears may be obtained by the excessive production of epithelial cells. The eyes are in a condition of extrepion, and there are often deformities of the mouth and other oridies due to the contractions of the skin. The nails and hair are usually imperfectly developed. The hody seems encased in a lated, horny covering, and looks as if it had been variabled or covered with collection. The skin cracks or splits and the edges card up, an appearance which has been aptly compared to the skin of a boiled potato.

In the milder form, the duration of life is indefinite, depending upon the degree of development of the discuse; but even in such cases there-

may be seen the deformaties at the orifices of the tody, and there may also be a continued, exfoliation of the epidermis in large irregular patches. After this has separated, the skin benesth appears red and most, but gradually becomes dry, hard, and shining, slewly contracting until it splits in various directions.

The outlook is unfavorable in all cases; in most of the severe forms death occurs in infacey, but in some of the milder ones, life may be prolonged indefinitely. The "alligator boy" of the "Dime Messum" is an example of this class.

Treatment.—The inficutions are to keep the skin moist and soft by the use of oils, routinuous faths, etc., and to prerent infection by perfect cleanliness. Although a certain amount of improvement month



Fig. 148.—Consciouras Icumrosus, Sex Wings

amount of improvement usually follows these measures, a cure is not to be expected.

MILIARIA

The term miliaria is applied to an obstruction of the awart glands, which may occur either with or willout inflammation. The non-inflammatory form is known as sudmines the inflammatory forms as miliaric rates, miliaris resiculous and miliaris payatams.

Sedamina. In this form there is no inflammation. The sweat dueta, according to Crocker, are blocked by an accumulation of epithelial cells

while no perspiration is going on; and when the process is restored the fluid, being unable to escape, accumulates in the form of tiny essicles. These appear like small pearly bodies very closely set, and disappear in the course of a few days by absorption. Fresh crops may appear from time to time. Sudamina may be seen in any of the continued fevers or enhancing diseases. It requires no treatment.

Miliaria Rubra.—This condition, also known as red gass, alrephalus, etc., is a swent rask, usually seen in young infants as the result of excessive clothing. It is most frequently observed upon the cheeks and neck, often upon the side of the face upon which the infant sleeps, or the side held against the mother's body while nursing, if this is done upon only one breast. The eruption consists of scattered red papules, sometimes with tiny vesicles. Millaria rubra is an inflammation about the sweat glands, the result of which is a retention of their secretion. There is generally little or no itching. The treatment consists in the removal of the came, and the application of some absorbent powder, such as boric acid and starch.

Miliaria Papulesa (Lichen Tropicus, Prickly Heat, etc.) .- This is the most common and most important variety of miliaria. There is in this disease an obstruction of the sweat glands by inflammatory products. The lesion consists in the formation of bright-red papules, which are very closely set, the summits of some of them being surmounted by tiny vesicles, and here and there in severe cases even small pustules may be seen. If not interfered with by scratching, the vesicles dry up without rupture, and are followed by a slight desquaration. Where there is much scratching, an eccenations condition may result. Miliaria papulou comes out with great rapidity, especially upon the neck, forehead, back, and chest. It is accompanied by an almost intolerable itching and stinging sensation. Over other parts of the body profess perspiration occurs. The disease is produced by very hot weather and excessive clothing. Although the duration of a wargle attack is but two or three days, in susceptible patients it may keep recurring for weeks, being exceedingly intractable. Where there is much scratching, the resulting ecosms is very troublesome. It is not infrequently followed by furunculosis.

The diagnosis of miliaria rabra and radiaria papulosa is usually easy.

They are distinguished from ecosma by the suddenness with which they appear, by the associated sweating of other parts of the body, by the transitory character of the eruption, and by the fact that the rash never occurs in circumscribed patches.

Prickly heat is to be prevented by light clothing, frequent bathing, and the plentiful use of a good todes powder, such as bone arid and starch. The skin should be protected against the irritation of flamed undergaments by the interposition of silk or lines. When the inflamECCEMA 923

mation is at its height, relief is obtained by the application of a calamin and nine lotion, or by a dilute solution of the acetate of lead; carbolic acid may be added to either, when the itching is intense. In some cases bland powders are preferable to lottens.

SEBORRHEA

Sebarrhea is considered by dermatologists generally, as a functional disease of the sebaccous glands; although Unra regards all such cases as parasitic in origin and inflammatory, and clauses them as seborrheic eczema. The disease may affect almost any part of the body, and children of any age, but the most frequent form is that which is seen upon the scalp in young infants. This is the most important variety, and the only one which will be here considered.

Seberrhea of the scalp is characterized by the formation upon the vertex, of dirty-yellow erasts, which are soft, greasy, and friable. They are composed of spithelial cells, fat-globules, and granular masses, to which is always added dirt. In neglected cases the hairy scalp is nearly covered by a dense crust, which may be as thick as heavy pasteloard. If the crusts are removed the underlying scalp may be found perfectly bealthy, but more frequently, in cases of long standing, it is eccentation. The ecoema is set up by the decomposition of the exudation, or by the efforts to remove the crusts by each means as the fine-toothed comb, commonly employed in domestic practice. There is little tendency to spantaneous improvement or recovery, and the condition often lasts for months. Every scherrhea should be treated, for when neglected it furnishes a favorable soil for the development of eccena.

Only local treatment is required. The crusts are first to be softened with cell, and then removed by washing thoroughly with warm water and susp, after which an continent of resorcin, 2-per-cent strength, or of sulphur, 10-per-cent strength, should be applied. The cell and scap and water are repeated every few days, or as often as the crusts form. In the meantime the scalp is kept covered with the continent.

ECZEMA

Eczema is the most frequent and altogether the most important discase of the skin in early life. The scope of the present work permits only a discussion of such features and varieties as are peculiar to infants and young children. The eczema of older shaldren does not differ in any essential points from that of adults.

Etislogy.-The conditions in infancy which predispose to ergoms are, first, that the skin is extremely delicate, and hence more easily affected by external irritants and microseganisms; secondly, its more intense glandular activity. While all children are susceptible, there are certain toes in whom the susceptibility is very marked, and in them the slightest amount of external irritation, or the most trivial disturbance of direction may preduce a severe cruption. Ecoma is one of the chief manifestations of the exadative diathesis (Cremy). It is especially prevalent in some families and is not infrequently inherited with the other stitleness of the disthesis. Ecomo is common in fat, healthy-looking infants, both in those who are nursing and in those who are artificially fed. It rarely occurs in poorly neurished children. Children with screma are not infrequently subjects of asthma in later life. Resome may apparently be initiated and is certainly aggregated by overfeeding, whether it he with broast milk or artificial food. The food element which seems to be particularly to blame is the fat, but farmaceous food in excess has also a bud effect. Schoos and Blackfan have shown that there is a susceptibility to animal protein on the part of most patients with ecoema, as shown by cutaneous tools with various proteins. Most of the patients are susceptible to egg whole and many to cow's milk. A few are enceptible to woman's milk. Some children even with severe events are incascoptible. The exact meaning of this susceptibility is not elear.

The conting cames of econa may be external or internal. Of the former the most important are lead, cold dry air, and winds—as in the familiar chapping of the face—the use of "land" water or of strong scaps in bathing. The disease may be due to the irritation of rlathing, to want of desalation, or to irritating discharges from macous surfaces, as in the externa of the upper hip, thighs, or buttocks. It accompanies most of the parasitic skin diseases, particularly pediculosis, scalins and rupworm.

What part is played by microimmisms in the etiology of exems has not yet been fully determined. As a primary factor they do not seem to be of the first importance. Secondary infection, however, occurs in most cases, and this is important in keeping up the disease.

Simple Chronic Ecrema—Ecrema Rubrum.—This is the most frequent form of occume occurring in infants and young children, and is usually seen upon the face. It affects by preference the checks, forehead, and scalp, not infrequently the cars and neck, and may essur upon any part of the leady. Upon the trunk and extremities the cruption is usually in patches, but in rare cases may cover nearly the entire body. The disease generally begins upon the checks with the formation of small red papules; later these coaleser, and there is a moist, red surface exading

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serum. The secretion dries and forms thick, gummy crusts, which may be so hard as to form a mask for the face. From the scratching caused by the almost intolerable itching, the surface bleeds freely, and the dried blood gives to the crusts a dirty-brown color and ands to the distressing appearance. The skin is often much swallen. After the removal of the crusts there is seen, in acute cases, a red, inflamed, granular surface, moist and bleeding readily. When the process is less active, there is redness, thickening, induration, and scaliness of the skin, and marked itching. In the same case these stages may alternate, exacerbations occurring whenever the exciting cause is partieularly active. From the checks the disease spreads to the forehead, ears, and scalp, and here similar lesions are seen. Upon the trunk and extremities thick crusts rarely form, but the skin is red, thickened, and scaly. The parts most often affected are the forearess, legs, abdomen, and back; occasionally the eruption is general. Eccema of the occipital region of the scalp is usually due to pediculosis.

Swelling of the lymph modes in the neighborhood of the scruption is a constant feature of occurs of the face and scalp; these may reach the size of a chestnut or walnut, and occasionally they may supported. Intense itching is a characteristic feature of all cases of occurs of the

face or scalp.

While most children with eczems are well nourished in the beginning, and some remain so during a prolonged attack, the general health of many is undermined. The itching and discomfort cause constant irritability, loss of sleep, and other nervous symptoms which cometimes seriously impair the child's nutrition.

The effects of very extensive ecosms resemble in some particulars those of burns of the second degree. There may be fever, delirium, other nervous symptoms and even a fatal termination. We have seen several cases with a generalized ecosma in which there developed, without evident cause, exceedingly high temperature, in two cases reaching 189° F., accompanied by symptoms of a most profound intoxication. Most of the infants with such symptoms die, but one child recovered in whom the temperature mentioned was reached. No satisfactory explanation of these severe intoxications has yet been effered.

There are some patients in whom an alternation of cosms and attacks of bronchitis with asthma may occur. During the eccema, the pulmonary symptoms are entirely wanting; but when the eccema is relieved the pulmonary symptoms rapidly develop. In a few patients an alternation of eccema and diarrhea is observed.

Patients with ecrema are exceedingly proue to develop attacks of diarrhea and this condition nearly always brings about a murked improvement in the skin, though the diarrhea is often difficult to control. Ecoma of the face is very chronic, easily improved, but cured only with great difficulty. There is a strong tendency to relapse, brought on by neglect of local treatment, by any digestive disturbances, or by overfeeding.

The predisposition to excema often ceases with the second year; those who have suffered from it almost constantly during infancy may be free from it during the remainder of childhood. This is in part to be explained by the loss of fat in consequence of more active exercise and a diet which is more largely nitrogenous. When the discuse continues through the third and fourth years, the associated infantile condition.

obesity, is not infrequently present.

Pustular Eccema of the Scalp.—This condition, often called "simple impetigo," is less frequently seen in infants than in children from two to five years old. There are usually present from half a dozen to fifty greenish-yellow crusts matting the hair, usually discrete, but sometimes coalescing to form a mask over half the scalp. There is very little itching, in some cases none at all. The lymph glands are invariably enlarged. This form of eczema is due to infection with progenic organisms. The children constantly re-infect themselves, and in this way the disease may be prolonged indefinitely. It is possible, too, that infection may spread to other children.

Intertrigo.—This term is rather indiscriminately applied to any eruption which develops upon two moist surfaces, which are in contact. It is often regarded as a form of eczema. There may be a simple crythema or an ecsema resulting from transmisism or the decomposition of secretions. Intertrigo is seen in the folds of the groin, between the scrotum and the thighs, between the buttooks, about the anns, in the axillae, in the neck, or behind the ears. Its assential causes are moisture, fraction, want of cleanliness, and sensetimes infection. The disease is generally seen in its worst form about the thighs, genitals, and buttooks; it sensetimes covers the sacrum and extends down to the middle of the thighs. There is an intense uniform redness, and in some cases the opidermis is denuded over large areas, and the surface is moist. There is no thick crusting and little or no itehing. Intertrigo is usually easy to control except in very peoply nourished or marantic children, among whem it is especially frequent.

Diagnosis of Eczema.—This is usually quite an easy matter. In the majority of cases, the disease affects the face or the scalp, and its appearances are typical. Eczetia of the body or extremities may be confounded with scalies or symbolis, and occasionally with other forms of skin discase. Scalies resembles eczema in its intense itching and multiform lesions; but in the former, one may often find evidences of its presence in other members of the family; the parts most frequently affected are ECZEMA 927

the flexures of the wrists, the ellows, the skin between the fingers, the margins of the axillas, the lower part of the abdomen and back, and, in toys, the penis; and by careful examination with a lone some of the chafacteristic burrows are certain to be discovered.

Syphilis is likely to be confounded with papular ceasms of the buttocks. The latter affects the parts near the anns, and the irritation may lead to the development of spots closely resembling musons patches. The local appearances may at times be indistinguishable from syphilis, and the diagnosis is to be made only by the other symptoms present. In syphilis the characteristic graption is seen usually upon the face, lands, legs, and semetimes the palms and seles; there is no itching and very little evidence of inflammation; the scaption is copper-calored, and occurs as small circumscribed spots; there are usually present other symptions, such as the curyon, the syphilitic cachexia, and enlargement of the spleen.

The diagnosis from pediculosis and ring-worm of the scalp, rarely presents any difficulties.

Progress.—All cases of chronic coresis are testions. There is only a alight tendency to spentaneous improvement, and very little to spentaneous recovery during early inducey. About the end of the first year the disease disappears in many children; some relapse after this time, but others are never again troubled with screens. In a severe case of general eczens the possibility of the development of severe toxic symptoms should not be furgotten. In any given case of eczens, the prognesis depends upon the duration of the disease, its severity, and very much upon the cooperation of the mother or nurse. The results obtained depend not only upon the particular line of treatment adopted, but upon how well it is carried out. Usually it must be continued for several mouths. Intertrigo is in most cases easily cured, unless the patient is suffering from extreme malautrosien.

Treatment.—A judicious combination of general and local measures is necessary for the best results. Unless disturbances of nutrition can be removed, local treatment will give only temporary relief. External causes also must be investigated.

A thresugh investigation into the food is necessary, not only as to its character, but as to quantity and preparation, the manner and frequency of feeding, etc. If the patient is a nursing infant, very fat and well nourished, the amount of food should be reduced by lengthening the interval between feedings and shortening the time which the child is allowed to remain at the breast at one nursing. Plain water, or better, some alkaline water, should be given freely between the nursings. In children fed upon cow's milk the quantity may be too great, or the trouble may be with the sugar, but more frequently with the fat. This should first be reduced and if no improvement occurs the sugar should also be diminished.

During the latter part of the first and the entire second year, the usual error is that of overfeeding, with in some cases an excessive use of solid food, very often with too much milk. The diet should then he much reduced, and the amount of solid food restricted. The diet which suits most children best is one composed of a moderate amount of milk, beef juice, broth, cooked frust and green vegetables; eggs and ment must be used with caution. The cereals—rice, wheat or harley—may be added, in small amounts at first. Any form of indigestion which exists is to be managed according to the special indications in each case. When there is a encouptibility to proteins, as shown by cutameous tests, a reduction or for the time a complete removal from the diet of the protein causing the reaction should be made with children over one year old. In older patients the results are sometimes very striking.

The diet of older children needs to be watched no less closely than that of infants. The general rules laid down clowhere for feeding after the second year should be observed.

Elimination by the kidneys should be stimulated by the very free use of water, to which may be added an alkaline district—the citrate or acetate of potassium, from ten to twenty grains daily.

Attention to the condition of the bowels is of the greatest importance. To avercome the tendency to constipation is in many cases to cure the cezema. Suggestions under this head will be found in the chapter on Chronic Constipation. The lowels must not only be opened, they must be kept open by the daily use, if necessary, of some of the milder lautives, such as magnesia, phosphate of sodium, rhubarb, or macara.

When the disease occurs in flabby, anemic, or poorly-nourished children, iron, arsenic and bitter tonics are required, but rarely cod-liver oil. In other words, the child's general condition should be treated just as if no eczema existed.

The general management of cases is important. The skin must be carefully protected by an aintment whenever the child is in the open air; if the weather is very cold, or there are high winds, children with artive exerns should not go out, but be aired indoors. Never should an eccenations surface be washed with plain water, and much less with castile soap and water. When washing is necessary, it may be done with bran water, milk and water, or statch and water, to which herex (a teaspoonful to the quart) may be added. The clothing should not be so excessive as to keep the child constantly in a perspiration. Napkan should not be washed in strong soda solutions, nor, in case of eczems of the buttocks, should they ever be used a second time after being simply dried.

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In excess of the face it is absolutely necessary to prevent the child from actatching the parts. The use of a mask is not always sufficient, nor the wearing of mittens; nor is the local application of anti-pruritic lotions or continents altogether successful. In severe cases mechanical restraint in absolutely indispensable. The most satisfactory method is to surround the arms at the elbows by pasteboard splints, and hold them in place by bandages. This allows free use of the hands, but makes it impossible for the child to reach the face.

Local Treatment.—Local treatment is always necessary, for not only are the causes sometimes entirely external, but the condition may persent after the original internal cause has been removed. There are several indications to be met by local treatment at different stages in the disease: (1) To remore crusts and other inflammatory products; (2) to allay congestion and acute inflammation; (3) to relieve itching; (4) to protect the delicate new skin which is forming; (5) to prevent infection; (6) to stimulate the skin in the chronic stages of the disease.

Preparatory to the use of any application, the scales, crusts, and other products of inflammation must be softened and removed in order that the diseased surface may be reached. In most cases it is sufficient to soften the crusts by the use of cline oil for twelve or twenty-four hours, and then remove them by soap and warm water. If the crusts are very lard and thick, they can be softened by a positive. During the stage of acute inflammation only sedative applications should be used, such as a lotion of nine and calamin.¹ A piece of muslin should be dipped in the solution, and applied to the affected part, being kept in place by a handage or the skin may be frequently wetted with the lotion which is allowed to dry on. If there is much itrhing, one per cent of carbolic acid may be added.

Another plan of treatment, where there is much secretion, is to keep the surface covered with equal parts of boric acid and starch or talcum pewder. An application which is often successful in allaying the intense burning and itching is black wash. This is applied several times a day in full strength or diluted and allowed to dry on, after which a protective ointment is used.

A soothing application in general ecorna is one composed of equal parts of lime-water and excert-almond oil; sometimes this may be advantageously followed by smearing the body with a thick starch paste and allowing it to dry on.

* B Puly, calanimo	preparation	. 74
Znci onidi		
Glycerina:		3i
Ligare calcia		. 51
Luine come		Territ.

As a simple protective statment, one containing starch, sinc axid, or bismath, either alone or in combination, may be used. An excellent formula is sinc oxid sintment with two per cent of salicylic axid.

Later, when the inflammation is less acute and the stelling severe, tar in the strength of ten to twenty per cent may be substituted for the saliertic acid.

All continents used should be spread upon muslin, and kept in close contact with the inflamed part by means of a landage or mask. Little or sothing is accomplished by simply rubbing the continent upon the affected part. An continent containing five or ten per cent of calcing is often the best application for an ecosta which is not too extensive.

The methods of treatment above mentioned are especially applicable to eczama of the face and scalp. For pustular eczema of the scalp the best application is the white precipitate ointment, which should be comtened with three or four parts of vanchine. This is excellent also for small evzenatous patches upon the body, but it is not to be used over a large surface.

In intertrage, the treatment should have reference to the pathological condition which is present. Cases of simple crythema usually yield promptly to chambiness and the free use of absorbent anticeptic powders, such as boric acid and starch in equal parts, or calomel two per cent may be used with talcom. If there is an acute demantitis, the calamin and sinc lation may be used, and later some protecting outment. When infection has been added, lotions of resortin or ichthyel, one-half of one per cent strength, should first be applied, and the skin then covered with one of the powders mentioned; both are to be repeated as often as the parts are wet by urine or soiled by faces. It is important in all cases that the succased variaces should be kept separated, which is best flow by boric acid and starch. All mapkins should be immediately removed when soiled.

In cases of chronic eczema, where the skin remains thickened, red, scaly, and itching, stimulating applications are to be used, such as the tincture of green scap or stronger preparations of tar.

FURUNCULOSIS.

A furnisele, or both, is a corromarrised inflammation of the subcutaneous cellular tissue, usually beginning in a bair follicle, and usually ending in suppuration. When severe, it may result in necrosis of the follicle, which forms the "core," or the necrotic process may extend to the currounding tissues for a variable distance. The ordinary bull need not be described, as it presents nothing peculiar in early life. The condition, however, which is characteristic of young children is the formation of small ones in great numbers. It is to this more especially that the term furanculous is applied. The principal location of these small abscesses is, in nearly all cases, the scalp, face, and shoulders, although they may be found upon any part of the body. They are sometimes numbered by hundreds, and appear in crops for a period of several months. In size, they usually vary from a pea to an almond, and they rarely contain a core. Infants are much more often the subjects of this discuse than are those who have passed the second year. In the great majority of cases furmiculosis is not serious, yet, occurring, as it often does, in infants who are already suffering from extreme malantrition, whose thisses possess but little resistance, the process may develop into a condition which may prove fatal.

Furunculosis may be seen in children who are in other respects apparently healthy, even robust; but the majority are in a more or less detail-tated condition, and often are the subjects of digestive disturbances. The disease is quite frequent in apphilitie infants; but these simple abscesses are to be sharply distinguished from those which result from the breaking down of gammata of the skin. Want of cleanliness of the skin is a factor of some importance in producing the disease. Furunculosis may be associated with eccents. The swriting cause in all cases, as shown by recent investigations, is the entrance of the staphylococcus pyogenes arrens, sometimes with other organisms, into the follicles of the skin.

Treatment.-The general treatment is to be directed toward any disturbance of digestion or nutrition which is present. Tonics are indicated in most cases, but no reliance can be placed upon drugs such as sulphid of calcium or the hypophosphites, in arresting the disease. Local treatment should have for its first object therough cleanliness of the skin. This is lest secured by frequently bathing the parts affected with a 1 to-5,000 solution of bichlorid. Single furuncles may often be aborted by touching them with pure earhelic acid or the application of Bier's cups. In our experience the last plan of treating the multiple small furuncles, is to delay incision until they have pointed, then to incise and empty the follicle completely by consuression. Where the abscesses are of large size and upon the scalp, it is wise to make compression by applying a song landage for a day. For general furunculosis or the continual recurrence of larger absences the use of staphylococcus vareines is altogether the most effective treatment. While autogenous vaccines are perhaps proferable, the use of stock vaccines seems in most cases to be equally effectime. Injections should be repeated every four or five days; beginning with fifty millions, the dose may be increased to one hundred millions. or even more. The beneficial effects in most cases are very striking and the cure permanent.

GANGRINOUS DERMATETIS

This is not a frequent disease, and is seen almost exclusively in infancy. It may be primary or it may follow other diseases, and hence has been described under many different names, via, surfeells gasgrenous, exthusis, pemphique quagrenous, etc.

The lesion consists in small, discrete areas of inflammation of the skin, emling in necrosis. In the primary cases there is usually first seen a vestele, about as large as a pea, with a dusky areola; it increases in size and becomes a pustule. Crusts form which are quite adherent, and on removing them a loss of tissue is seen. The ulture usually have sharp but not undermined edges, often presenting a "punched-out" appearance. By the coalescence of several smaller ones, alters an inch or more in diameter are sometimes formed.

The primary form of gaugernous dermats is occurs in wretched, poorly-nourished infants, and is most often seen upon the buttocks. In this location it may be mistaken for syphilis. The occurdary form is more common, and usually follows caricella, loss frequently vaccinia, or impetigo. In such cases the lesion is most often occu upon the upper half of the body, especially upon the neck and chest. It follows the ordinary lesions of varietila and continues usually, in spite of treatment, from one to four weeks, in many cases ending fatally. The disease always occurs in infants of poor vitality, often in those suffering from marasmus, and is solven seen outside of institutions. It may be accompanied by fever, and other severe constitutional symptoms.

For the production of the disease, two factors are necessary: first, the constitutional condition referred to; and, secondly, the entrance of progenic germs, usually the atroptococcus pyogenes.

Treatment.—Every means possible should be employed to build up the general health of the infant by fresh air, careful feeding, etc. Lecally, strict cleanliness and antiseptic applications are necessary. The best application is a solution of bothlorid (2 to 5,000), or an ointment of ichthyol or white precipitate.

IMPETIGO CONTAGIOSA

Impetigo contagiosa is a disease characterized by the formation of discrete resiculopastules, occurring most frequently upon the hands and face. Cases are usually seen in groups affecting children in one family or institution. Impetigo may be communicated from one person to another, and spread by auto-moculation from one part of the body to another. One rarely has an opportunity to see the disease until vesicles have formed. These are usually from one-fourth to one-half inch in diameter, and are flaceid, never distended. Later, their contents become slightly yellowish; then they repture and dry, forming thick yellow crusts, which have the appearance of being "stack on," the surrounding skin being quite healthy. After the crusts fall off, a small red patch remains, which slowly fades. The true skin is not involved, except in poorly nourished, enchectic subjects, as a result of continued local irritation, like scratching. Under such conditions obseration may occur. Instead of the small vestculopustules described, bullas from one to two inches in diameter may form, filled first with scrum, afterward with sero-pus. Very little inflammation is seen about these patches, and in most cases the intervening skin is normal.

The favorite scat of the eruption is the face, especially about the chin, next the hands, the neck, the feet and legs, the focurries, and the scalp; it is rerely seen upon the abdomen, and never upon the back. There may be only half a dozen resimbopustules, or from thirty to forty may be present. The smaller ones sometimes coalesce and form others of considerable size. Itching is never a prominent symptom, and in most cases it is absent altogether.

The usual duration of impetigo contagiosa is two or three weeks; it, however, runs no regular course, and by continued auto-insculation may last much longer than this.

The studies of Gilchrist point to a streptococcus of low virulence as the cause of this disease. European investigators, however, have more often found the staphylococcus pyugenes aureus in the vesicles. Impetigo contagiosa may occur in any child, but is seen most frequently in one who is poorly nomished.

The diagnosis is not often difficult, and is made by the following features, viz., the occurrence of several cases together, the isolated resiculopustules situated upon the face and hands, the slight itching, and the prompt cure by local measures only. The bullous form, however, is frequently confounded with pemphigus; many mass in which the diagnosis of pemphigus is made are examples of impetigo.

Treatment.—This is simple and usually very effective. The crusts are to be softened and removed by thoroughly washing the part with soap and water or a highlarid solution, after which the white precipitate sintment, combined with three parts of vaseline, should be applied.

URTICARIA

Urticaria is a frequent disease in early life, and presents some features, particularly in infants and young children, which are quite dif-

ferent from those seen in while. This is due to the fact that papules and vesicles, and seconomily postules, are associated with the wheals. As the wheals quickly subside, it frequently happens that the other lestons mentioned are the only ones present. This fact has given risc to considerable confusion in names, and the urticaria of infancy has been called lichen urliculus, articoria papuloso, strophulus, etc. It is now pretty generally agreed that the clinical picture, which is a familiar one, belongs to a single disease, and that this is urticaria.

The initial lesion is the wheal, but on account of the extreme susceptibility of the skin in young children, the process is more intense than in older patients, so that it may result in the formation of an inflammatory papule or a vesicle. In a few hours the wheal may subside, and only the papules or resides remain, and without a good history the disease may be a very obscure one. The papules and vesicles occur with greatest frequency upon the hands and feet, particularly the palms and schen.

The more severe form of the disease in poorly nourished children is sometimes accompanied by a postular eruption, and there may even be deep ulcoration (ecthynn). The usual appearance of the eruption is a number of small inflamed red papules whose tops are covered with crusts, the result of scratching. The eruption may be limited to the extremities or it may be general. It is as a rule more severe in regions accessible to scratching.

There is usually severe itching, which leads to loss of sleep, and often in this way the disease affects the general health of the child. The urtis caris of older children does not differ essentially from the same diseasin adults. The alternation of urticaris and asthma is occasionally met

with.

The character of the eruption in urticaria and even its distribution often suggest scables; and unless one has had an opportunity to witness the development of the lesions, a differential diagnosis may be very difficult, as almost every lesion, except the wheal, may be identical in both diseases. Other cases may resemble varicella.

Urticaria in early life is most frequently the result of some disturbance in the digestive tract. Almost any sort of darangement may pro-

duce it, the exciting cause varying with the patient.

Treatment.-The militer forms of urticaria usually respond quickly to treatment; but when it is errore and has existed for several weeks, it is one of the most treublesome and intractable skin diseases of childhood. The treatment is to be directed primarily toward the condition of the digestive organs. Children should be put upon a very simple diet, always cooleding sweets, and usually fruits, especially raw fruits. The howels should be kept open by calomel, a nightly dose of castor oil, or a

SCADIES (33)

morning dose of magnesia. If the trine is excessively acid and seanty, alkaline distreties should be given.

All local causes of irritation, such as rough flannel underclothing, should be removed. The sleep may be so much disturbed as to require the use of trional or bromid and chloral.

The local irritation and itching may be relieved by a very dilute solution of the subscetate of lead or cartolic axid, or by diluted vinegar, or the fluid extract of hamamelia, or bicarbonate of sods, and water. In severe articaria almost immediate relief may be obtained by the hypotermic injection of three to eight drops of a 1-1000 solution of spin-sphrin; the relief often lasts twelve to twenty-four hours. When pustules are present, the white precipitate contracts may be used, combined with four parts of taseline; in the papular and tesicular forms, an contract of ichthyol, one-per-cent strength. In many cases the improvement in the general health by the use of tonics, change of air, etc., will accomplish more than any measures directed especially to the relief of the articaria.

SCARIES.

Scables is a contagious disease due to the burrowing into the skin of the female arraw, with secondary lesions which result from acratching.

The burrowing of the nearus is usually where the skin is thinnestviz., between the fingers, on the flexor surfaces of the wrist, the axillae, and, in males, the genitals. It is not seen upon the face, except in infancy, when infection may occur from contact with the breasts of the mother. The lesion excited by the scarus is usually a papule or a vesicle, sometimes a pustule. In some cases no evidences of inflammation are present, but in infants and young children they may be marked-pustular eruptions being frequent and often extensive, especially upon the hands and feet. The characteristic burrow is from one-fourth to one-half inch in length, and appears as a fine brown or black line, at the end of which the acurus may be discovered as a small white speck. The burrows are often difficult to find in infants. They are generally to be seen along the ulner border of the hand and between the fingers. The intensity of the inflammatory Issions varies greatly in different cases; in some they are very few, while in others, particularly in delicate, cachectic, and neglected shildren, they are sometimes very severe, so that the skin of the affected part is nearly covered with postules. These secondary lesions. are due to infection by the streptococcus or slaphylococcus. A pustular emption upon the hands should always suggest scalies. The lesions which result from scratching may be found on any accessible portion of the body. They are usually at first linear, bloody marks, but after a time these may not be visible. In little children urticaria is often associated.

The diagnosis of scalins is usually quite easy, as several children in a family are bindy to be affected, particularly if they occupy the same bed. The diagnostic features of the cruption are the presence of papules, vesicles, or postules, superially upon the hands, wrists, and genitals. A careful examination with a lens will usually disclose some of the chararteristic barrows, or even the acurus. In infancy, scabies may be easily confounded with the vesicular form of articaria, unless the development of the lutious has been observed.

Scahirs may always be cured, provided sufficient precautions are taken to prevent re-infection. This necessitates beiling or baking, not only the

patient's clothes, but all the hedding as well.

Treatment.-This should always be begun by a hot hath, in order to soften the spithefial scales about the hurrows. The body should be thoroughly serubbed with soap and water, preferably with a nail-brush, the both being continued for at least half an hour. It is well to do this at night. After the lath, the body is anointed with the parasitivide, which should be thoroughly milled into the skin, clean clothing applied, and the child put into a perfectly clean bol. In the morning the sintment may be washed off, but none of the clothing previously worn should be put on. This treatment is to be repeated on two or three successive nights, and if thoroughly done it will effect a cure. The ordinary sulphur sintment is too irritating for use in little children, and one of the following may be substituted: \$\beta_{\text{naphthol}}\$, 15 parts; creta preparata, 10 parts; suscline, 100 parts (Kaposi); se, precipitated sulphur, 1 part; buleam of Peru, 1 part; vaseline, 8 parts; or the simple lulsam of Peru may be applied without dilution. After the use of the parasiticide there is generally required, for a few days, some soothing application like those mentioned in the chapter upon Erpema.

TINEA TONSURANS-RING-WORM OF THE SCALP

Bing-worm of the scalp is a very frequent disease in institutions for children, often occurring as an epidemic. According to Crocker, the primary lesion consists in a red papule surrounding a hair, which soon increases to a small circular patch; this spreads at its center margin, gradually increasing in size until it is from one to two inches in diameter, but rarely larger than this. Sometimes several of the patches coalesce. These affected areas always have rounded borders, and are sharply entlined. Here the hairs are very brittle, and often broken off close to the scalp, so that the area may appear to be hald. Where they have not fallen off, the lairs have lost their laster. The stumps of the broken hairs point in all directions.

The fungi which produce the disease belong chiefly to the group of small speed fungi or microsporous. Of the several microsporous that have been shown to have stiological significance, the microsporon Audouini is the one of importance in this country. The large-spored fungi (tricophyton trateriforms or tricophyton asyminatum) are responsible for a small proportion of cases. The fungi penetrate the shaft of the hair, both the spores and the myceliam being seen under the microscope. The spores are present in great numbers in the hair, but the mecelium is most abundant in the scales. The amount of inflammation found in the diseased areas varies much in the different cases. There may be only a scaliness of the scalp, or a formation of pusinles in the hair follicles, the hairs loosening and falling out in consequence. In young infants, where the hair is scanty and thin, the disease resembles times circinata-Le. it is seperficial, and the hair follicles are often not involved. Children of all ages are liable to times tensurans. It flourishes particularly in institutions and among those children who are dirty and generally neglected.

The diagnostic feature of the disease is the presence of scaly patches, with loss of hair. The patches are usually circular, and by examination with a lens the stumps of broken hairs are seen all over the diseased areas. By a microscopical examination the fungus is discovered. In typical cases the diagnostic is easy if the process is at all advanced, but there are many ntypical forms and many mild cases where the recognition of the disease is difficult. The symptoms are often masked by the inflammatory conditions present. The disease may be confounded with seberrhea; but in the latter the lesion is diffuse, never sharply defined; there is general themsing of the hair over the scalp, and never the stumpy, broken hairs. Processes has points of resemblance; but it is usually found on other parts of the healy, especially the knees and elbows, and upon the scalp the patches are more numerous and smaller. In eczenta the loss of hair in circumscribed patches is never seen, nor are the broken stumps.

Times tensurans is always curable, provided the patient can be kept under close surreillance, and treatment thoroughly carried out, but it is particularly obstinate. There is no tendency to spontaneous recovery except toward pulserty, when many of the cases recover even without treatment. In a recent case, treatment must usually be continued for several weeks or months, and in chronic cases from six months to one year, with the closest wat-bfulness.

Treatment.—The great difficulty in treatment is to get the parasiticide deeply enough into the sculp to reach the fungue, since this is often at the very bottom of the hair follicles. As a first step, the hair should be out short all over the patch and for at least an inch beyond it; this is necessary in order to get at the diseased part and to detect new foci of infection early—if possible before the fungus has extended deeply into the follicles. The parasiticide should be applied not only upon but around the patch, and the entire scalp should be washed theroughly two or three times a week. To prevent the disease spreading, all the scales are to be kept softened by the use of carbolic soap. The hair should not be brushed, as this tends to scatter the speces and spread the disease. All patients, while under treatment, should wear a cap of muslin or siled silk, or one lined with paper, in order to prevent infecting others. In institutions, affected children should invariably be isolated.

To destroy the fungus almost every germicide on the list has been advocated at one time or another, which proves that the disease is a very obstructe one, and that no one application is invariably successful. Care depends more upon persistent treatment than upon the drugs usel. Those which have the sanction of the widest use are the fincture of iodin, the bishloud, white precipitate and elente of mercury, \$\mathcal{G}_{in}\$ applitude, chrysarchin, crossote, carbolic acid and croton oil. As a vehicle for ointments, adept lanae (lanotine) is greatly to be preferred to vaseline or lard. Epilation is necessary in many cases as an accessory to the application of germicides, particularly in other shibbren. The X-ray has been employed by Salioumuid, Noiré and others. The greatest care abould be exercised in its use or permanent haldness may result.

CHAPTER VI

DISEASES OF THE EAR

ACUTE OTITIS

OTITES is a frequent affection during infancy and early childhood, attacks usually occurring in the cold season. Of all the inflammatory conditions which may be met with in early life, there is perhaps note which more frequently gives rise to obscure febrile symptoms than this

Etiology.—Acute etitis is, as a rule, a secondary disease, and is generally preceded by some infectious process in the rhimopharyns. The usual groups of infection is the Eustachian tube.

While it is most commonly seen following simple rhimpharyngitis, the most severe forms of otitis follow scarlet fever, epidemic influence, measies, diphtheria, or precumonia. The entrance of fluids through the Enstachian take from the nasal deache or usual syringing may cause acute otitis. It semetimes results as an extension of inflammation from naulingitis, supecially the cerebrospinal form. Otitis is very common in hospital patients, especially poorly naurished infants. In them it is found with bittle or, more frequently, with no evidences of a thinopharyngitis.

The microorganisms concerned in the production of acute offits vary somewhat with the condition of which it is a complication. In the order of frequency there are found the staphylococcus aureus, the preumococcus, the streptococcus, and the influenza bacillus. Mixed infections are very common. In cases complicating diphtheria, the Klebs-Loeffer facillus may be found with any of the forms mentioned, or may occur alone. In chronic cases any of the pyogenic organisms may be present, and not very infrequently the tubercle bacillus.

Letions.—The ordinary course of events in the pathological process is, first, acute hyperenus and swelling of the mucous membrane of the rhinopharynx, which extends into the Eustachian tube, causing obstruction more or less complete. The inflammatory process may be limited to the tube, or it may extend to the mucous membrane lining the middle car.

There are two varieties of acute inflammation of the middle ear: (1)
The catarrial form, which usually accompanies simple catarrh of the
thineplatyne or complicates measles. This is an inflammation of the
macons membrane merely, and its products are serum and mucus or
muco-pus. It is generally confined to the lower part of the tympanic
varity, and is the form most frequently seen in infants. (2) The purulent or phlepmonous form, which affects older children principally. This
is a much more serious inflammation, and is often excited by the infectious catarrh of scarlet fever, or diphtheria. In this variety microioganisms find their way into the middle car in great numbers, and set up
an inflammation of a more virulent type, which may involve not only
the nucous membrane lining the tympanim, but also the cellular tissue
in the upper part of the tympanic cavity. The lining membrane of the
masterial cells is involved in many, if not all, of the cases.

The catarrhal form of inflammation frequently subsides in a few days with proper treatment, the only result being a slight deafness, which is temporary. The phlegmenous form causes a stoppage of the Enstachian tube, rapture or sloughing of the tympanic membrane, and discharge of the products of inflammation, or rarely pus finds an outlet by terrowing between the cartilages. The inflammatory process may extend to the bones, causing necrosis of the ossicles or the bony walls of the tympanum. The remote results are persontitis and necrosis of the petress hone, puchymeningitis, infectious thrembons of the lateral sinus, general purelent meningitis, and cerebral aboves. These will be considered under Complications.

Symptoms.—These are usually few in number, but present great variability as regards their combination and intensity. The two most constant symptoms are pain and fever. In a typical case in an infant, there is generally at the beginning some discharge from the ness, slight congestion of the pharyax and tensils, and a temperature of 100° to 100° F. There is nothing characteristic about this catarrh. After two or three days the objective symptoms subside, but the infant continues to be restless, worries much of the time, wakes frequently at night with a start, nurses poorly, and the temperature remains elevated, usually from 100° to 103° F. (Fig. 150). The infant seems decidedly ill, and



Parl 150.—Transparence Chairs of Acres Orms Policenzo Interestra, in a Const. Trans. Texas. Otto.

yet no very definite symptoms are present. Rarely there is marked tenderness about the car, and the child refuses to lie upon the affected side, or shows signs of pain when the car is teached. After a week or ten days spentaneous rupture of the drum membrane takes place, and subsidence of the constitutional symptoms follows. In some cases there is seen only a high temperature, ranging from 101° to 104° F., which persists for several days without entward evidences of pain or other sight of inflammation, and the discharge is the first symptom which leads the physician to suspect discuss of the ear. In other cases there is marked dulness, apathy, anorexia, and sometimes nauses and vomiting, but for several days no evidence of pain; the temperature may be but little elevated. Thus, in most of the attacks seen in infancy, pain is not marked, and it is this fact which so often leads to the obscurity of the symptoms.

In older children the symptoms are more characteristic. Pain is

usually sharp and severe, and is complained of early in the attack. The temperature is nearly always elevated two or three degrees, and occasionally it is 101° or 104° F. (Fig. 151), with severe headache, extreme restlessness, and even delirorm or convulsions, so that meningitis may be suspected.

The inflammation does not necessarily go on to suppuration and rapture. There are even more frequently seen, accompanying ordinary head-colds or mild attacks of influence, cases in which the pain is quite

severe for twenty-four or thirty-ox hours, and accompanied even by a moderate elevation of temperature, and ret which rapidly subside without further symptoms.

In infants suffering from malnutrition or marasmus, otilis often comes on without my objective symptoms, the first thing noticed being the discharge,

Of all the symptoms, fever is the meet constant, and is present in all cases except those just mentioned. The usual range of temperature is from 100° to 102° Y.; exceptionally it may be from 101° to 105° F. The course of Fig. 151.-Traversarvar Cause or the temperature is irregular. After spontaneous rupture or incision of the dring membrane the temperature usaally falls, but often not immediately, Pain is more marked in older children than in infants, because in the latter. the dram membrane is not so firm. yields more readily, and ruptures ear-



Avere Overs Amoren av Easta PARACRETERS. Buy nine years old; attack followed a mild ratank; meses pain in both cars began in afternoon of second day. Both draw membraces found acutaly congreted and being: invision followed by free homorthigs and immediate relief of pain. No repression occurred; patiest well on fifth day.

lier. Tendemess is sometimes elicited by pressure, especially just in front of the external auditory meatus; there may be increased sensitiveness of all parts of the car and even of the whole side of the head; but no reliance should be placed upon the absence of such symptoms in excluding obitis. Children often complain of noises in the ear. Cerebral symptoms are infrequent, and scent chiefly in cases not receiving proper early treatment; they may indicate meningral congection, or, less frequently, localized meningitis or thrombosis.

In secondary ofitis, especially when complicating severe scarlet fever, diphtheria, measles, or typhoid fever, all subjective symptoms are free quently wanting; unless the cars are examined the disease may be overlooked until rupture has taken place.

The local appearances in the early stage are marked reduces and ourgestion; later there is distinct bulging. If perforation has taken place,
its site may or may not be visible, but its existence may be assumed if
bubbles of air are seen deep in the canal, and if, in the absence of a furuncle or marked ecount, much muons or pas is present, as inflammation
of the external canal seldom causes a discharge. In the catarrhal form
the discharge is at first sero-muons and quite profuse; later it is purulent. In the phlegmonous form it is always purulent, and liable to a
sudden arrest with an increase in the constitutional symptoms. The pussometimes burrows between the cartilages and escapes externally behind
or at the side of the car. Barely it may work its way anteriorly and
cause an abscess in the parotid gland.

Biagnosis.—Onitis in infancy is frequently obscure, because the patient is too young to direct attention to the seat of pain, or because the pain is slight or absent. The temperature is almost invariably sterated, and the usual problem presented is to discover a cause for this force. The examination of the cars with a speculum should be made as a matter of routine in all children with fever, especially those in whom the cause of the fever is not perfectly clear. Otherwise many cases will be overlooked. A learneytesse of 15,000 to 20,000 is almost invariably found. Local tenderness, dealness, or noises in the ears are significant when present, but are aften wanting. Other is so common a cause of high temperature in infants during the cold season, that one should always have it in raind.

Complications and Sequelae.—Remote consequences are most likely to be seen in cases following scarled fever, probably because of their severity, particularly when early treatment has been neglected.

Master Wis.—This is the most frequent complication of neute of this. In infancy the master'd process is small and contains but a single savity, the master'd antrum, which communicates directly with the vault of the tympanum. It is probable that in every severe case of acute supportains of the middle car after the tympanic membrane is incised or ruptures spontaneously. The principal cause of master'd involvement is want of proper early treatment in acute of itis, particularly the practice of allowing these cases to take their natural course instead of securing early drainage by incision of the dram membrane.

The important symptoms of acute mastooditis are fever, mustoid tenderness, and swelling. If mustooditis develops rapidly after acute offits the temperature may be high—101° to 105° E, and the leurocytosis is somewhat greater; if it develops gradually and appears late the temperature may be scarcely above 100° E. Alternet constitute of an ear discharge should always aroms suspicion. It is always difficult to determine the presence of a slight amount of mastoid tenderness, but persistent tenderness of one side only is significant. It is often most marked close behind the suricle just over the antrum. Care should be observed in ascertaining tenderness to make pressure only over the mastoid. When there is eccent or furureulose of the canal pushing forward the suricle causes pain. The early swelling is due to edema from periosities; later there may be an accumulation of pus beneath the periositeum. Post-auricular abscess causes a very characteristic swelling, the ear standing cet from the head. It is usually due to spontaneous repture through the outer beny wall just over the autrum; it may occur when there has been no discharge from the ear; but mastoiditis practically never occurs as a primary homotogenous infection and examination of the drum membrane will reveal unmistakable evidences of an atiris media. It is a frequent result of source cases of scute mastoiditis not operated upon, especially in young children.

The characteristic otoscopic appearances of neute mustolditis are, hulging of Shrapnell's membrane and drosping of the upper posterior

wall of the external auditory canal due to edema.

Mesingible.—This is very rare in infants, but is more common in other children. There may be a localized pachymeningitis with the formation of pus—an epidural absence—or, less frequently, general purulent meningitis. It may be secondary to other lesions, such as thromlesis of the lateral sinus, or the rupture of a cerebral absence, but is usually due to infection through the roof of the tympurum, or along the internal auditory meatus. Meningitis may occur either with neute or chronic cases. Its symptoms are those of a severe acute meningitis; its duration is short; its termination almost invariably in death.

Cerebral Abscore.—Thus is due to a direct extension of the infection from the bone, veins, or dura mater. In about two-thirds of the cases the abscess is in the temperosphenoidal lobe. The next most frequent sent is the lateral lobe of the cerebellum. Korner states that disease of the masterial and middle car leads to cerebral abscess, and disease of the labyrinth to cerebellar abscess. Abscesses may be complicated by thromlessis or by maningitis. They are often latent until just before death, which more frequently occurs from the development of purulent meningitis than from any other cause. They are more except in otitis of long standing. (See Cerebral Abscess.)

Thrombonic of the fateral sinus may be simple or septic. In the former there is occlusion of the result by a filtrinous clot; in the latter there are in addition, microorganisms.

Simple thrombosis causes no important symptoms. Septic thrombosis is relatively infrequent and causes very marked and severe symptoms. It follows operation upon the masteld, or occurs as a complication of masteriditis quite apart from operation. The temperature is usually
of a high and wately fluctuating type, and there may also be chills with
older children, but this cannot be depended on as evidence of thrombosis in infants or young children. In some cases the constitutional
symptoms, except fever, may not at first be severe, but may suddenly
become very grave. Marked symbol symptoms often develop rapidly,
and death may follow in from twatte to twenty-four hours. At antaper
there may be found a soft broken-down rilet in the sinus, which may
extend into the jugular. It may be followed by secondary lesions of a
general pyemia, or by localized or general meaningitis. Blood cultures
usually give positive information, but it is often necessary to make several before organisms are found.

The labyrinth is infrequently involved, although cases are recorded by Pye, Phillips, and others, in which the necroses and discharge of the entire labyrinth has overreed after searlet fever. In most of these cases

the deafness was complete, and in sessual vertigo was present.

Faces' perolysis rarely occurs in the acute rases, but accompanies a remiderable proportion of the chronic ones. It is especially seen in the tuberculous variety. It is due to an extension of the inflammatory process from the lame to the seventh nerve, where it passes through the canal. The symptoms are those of ordinary peripheral facial palsy. The prognosis is good for resessery in the non-tuberculous variety.

Treatment.—Something may be done in the way of prophylaxis. It is of the first importance to accure a normal condition of the mucous membrans of the rhomopharynx by the removal of enlarged toneils, adenoids, etc. The occasional attacks of attais accompanying these conditions are pretty sure to be followed by more serious trouble unless they are relieved. Repeated attacks of otitis media in childhood are responsible for fully eighty per cent of the cases of chronic cutarrhal deafness in adult life. Whether during attacks of measles or searlet fever, much can be done to prevent otitis, is still a mooted question. We believe the risks of infection of the middle our when judicious mosal syringing is employed are less than when nothing is done to cleamse the rhinopharynt.

The medical treatment of acute otitis aims at the relief of pain and arrest of the inflammation. If the case is seen in the early stage the introduction of a few drops of a solution of epinephrin into the nostrils and cars and repeated every two or three hours, will sometimes about an attack. Carbello acid in slive oil in a strength of ten per cent has an undoubted effect in allaying inflammation if applied in the early stages. This may be aided by free catharsis and the application of dry heat. Landanum should not be dropped into the ear as is so often date in demestic practice; but there is no objection to a few drops of a feer-per-cent solution of socials, which may relieve intense pain. If the child

is not seen comfortable, an epiate should be given which may not only relieve pain, but may have a favorable influence upon the inflammation.

A centinuance of pain in spite of these measures, with an increasing temperature, calls for operative interference. But a more reliable guide is the appearance of the drum membrane. If in addition to these symptoms there is masterd tenderness immediate puracentesis of the drum membrane is imporative. An early incision is usually followed by a discharge of blood only; but tension is relieved, pain disappears, and the inflammation often quickly subsides without the formation of pus, (See Fig. 151.) Much suffering is thereby avoided; the wound rapidly heals, and much less damage is done than by allowing the disease to go on to a spentaneous rupture. Later facision may be required either for the relief of pain or for the ovariation of pure to prevent, if possible, the disease from spreading to the body parts. The advantages of early paracenbasis in acute otitis can hardly be overstated. Properly performed, it is free from risk, causes little or no shock, and should be advised in many cases even in which the indications are not so clear as those above described. Incision of the drum membrane should be favored in cases of doubt rather than waiting for more definite indications with the attendant risks of delay.

In the secondary editis of scarlet fever, measles, and diphtheria, the indications for paracentesis are usually to be derived from the appearance of the dram membrane alone, other symptoms being absent or marked by the primary disease.

After incision or spontaneous reptace of the drum membrane, to prevent the wound from closing and to cleanse the parts, the ear should be syringed every two or three hours with a warm saline solution, or a saturated solution of horic acid. A bulb car-syringe of soft rubber or a fountain syringe may be used. The external auditory canal should be carefully dried after irrigation to prevent materation and the development of eccens.

In most acute cases the discharge cases in from one to three weeks; should it continue longer, some measures for checking it may be used. The use of a few drops of a 1 to 3,000 solution of bichlorid in sixty-five per cent alcohol after syringing is of some value. It should be used with a medicine dropper. When the discharge has become fetid, syringing once a day with a solution of peroxid of hydrogen (4 to 2) is often useful. A persistent discharge often depends upon the fact that the child's general condition is poor, and improvement in this is more important than any variation in local treatment.

When symptoms pointing to neuto mastoiditis are present, early free incision of the dram membrane is indicated, and a mastoid icebag should be applied intermittently for twenty-four to thirty-six hours, In addition, in alder children, the artificial beek may be placed over the antram or the masterial top. With these measures the inflammation often subsides. Regarding operation open the masteri, our belief is that it is now performed too frequently and with insufficient indications, especially in inflancy and very early childrend. The operation is a serious one, and at this age its immediate risks are considerable. We have known of a number of deaths directly connected with it, and of others occurring at a later period, where the child was worn out by the long after-treatment, dying perhaps from some intercurrent disease or from exhaustion. On the other hand, the dangers to which very young patients are exposed who are not operated upon have been exaggerated. In our experience, meaningitis, sinus thrombosis, and cerebral abscess do not occur in anything like the proportion of cases that the surgeons would have us believe.

While fully appreciating the value of the operation, and being quite sure that lives are often saved by its timely performance, we would insist that it be done only with very positive and clear indications. In infants, localized tenderness is difficult to determine; and fever after scate office may be due to many other conditions. In very young patients we should therefore limit upon other symptoms before deciding to operate. The risks of uniting for eleuter indications are much less than those attendant on unnecessary operation. Often the cause of the temperature is found in the longs; and not very infrequently a moderate pulmonary congestion or broughtis becomes a paramonia as a consequence of the prelonged anesthesia necessary for the operation. With infants therefore in case of any doubt, as to diagnosis or the progress

If metadate follows the outs which complicates the scare infectious discases of early childhood as often as his been claimed, we must admit that a very large proportion of the purients may get well without operation.

The records of the New York Franching Haspital; with a resident and constantly changing population of about 800 infants and young children, showed 573 cases of acute otitis in five years (1900 to 1904, inclusive). During this persod there were three extensive epidenzies of mension with a total of 1,004 cases; 106 roses of resulet fever; 578 cases of dightheris; and 1,506 cases of pnesitionia. With the 578 cases of otiles, seute metoditis was recognized and recorded in but 17 patients. It is not improbable that other mustoid influrmations were overlooked. In this institution, however, nearly every fatal case comes to antopsy, and if an unecognized musicolitis had led to a fatal result the autopsy records should show it. In the five-year period, 900 autoposes were made. There was no entance recorded of aboves of the brain following citibs: There were but two examples of some meningitis following stitis with mastoolitis; but there were 14 more of acute meningitie secondary to other condtions-pneumonia, 10; to pericustitis, 2; to empyema, 1; to dightheria, L. During the period mentioned there were II masted operations performed in the hospital, with 6 recoveries and 5 deaths, all from rauses directly connected with the contation.

of the case, one should invariably decide against operation, or at least for postponement. With older children, however, conditions are somewhat different; diagnosis is easier and the operative risk much less.

The treatment of chronic cities and of the associated conditions is largely surgical, and belongs to the specialist; but it is extremely important that the general practitioner should be familiar with their symptoms, and realize the danger from these neglected cases, not only to the function of hearing, but also to life itself. The essential thing in treatment is that the operation should be thorough enough to secure free drainage, and to permit thorough cleaning of the parts. Too much can not be said against the expectant treatment of these cases, or against the practice of prolonged poulticing.



SECTION IX

THE SPECIFIC INFECTIOUS DISEASES

A more accurate knowledge of the causative agents of the various infectious diseases has made necessary a revision of the opinions once held regarding the manner in which they are communicated. It was formerly believed that most of the common contugious diseases were airbetne infectious. Smallpox and searlet fover especially were vited as ramples of diseases which could be conveyed by air currents at a considerable distance from the body. It was believed that these and other contagious diseases were frequently carried by a third person. It is now pretty definitely established that such contagion is possible only for a very short distance, probably but a few feet from the patient, and that communication through a third person is an extremely rare occurrence. In the surend of contagious diseases, articles of clothing, toys, books, furniture and other objects which had been in centact with the patient were once regarded as frequent sources of infection. While it cannot be demed that these are sometimes the vehicles of contagion, this mode of spreading these diseases is certainly infrequent.

Infection, as a rule, is acquired either by contact with or close precimity to a person suffering from a contagious disease. By contact there may be actual transfer of the organism enouing the disease. By precimity the specific poison of the disease which is discharged from an infected person, usually in the form of minute droplets by coughing or anessing, may be inhaled. In this way whooping-cough, epidemic catarris and measles in the early stage are probably most frequently communicated. Measles and scarlet fever are often spread in the later stages by the discharges from month, nose, eyes, cars or glands.

There are two very important sources of infection which are constantly everlocked. The first is the unrecognized case, which escapes notice, in searlet fever, because of its rolld character; and in inherentesis, because the early stage is so prolonged. The second source is the group of persons known as "curriers." To the latter are very often traced epidemics of typhood fever and diphtheria; rarely, epidemics of ecostrospinal meningitie and acute policonyclitie. Carriers are persons who harbor the organisms of infection, usually as the result of a previous attack, sometimes because they have been in close contact with the dis-

case, but are not themselves at the time suffering from it. The recognition and segregation of these carriers constitute one of the most difficult and important problems in connection with the prevention of communicable diseases.

Infection may take place through the infinition of dust particles which contain the specific organism of the disease. The bacilli of tuber-rubosis, diphtheria and typhoid may survive drying and become a part of the dust of the room. While mostly present in the upper air of the room, they may be found in places where dust settles, as on floors, wondow-sills, etc. Infection of older children or adults by actual inhalation of these organisms with dust is probably very uncommon; but small shildren, playing much on the floor, may easily acquire infection from dust upon hands, toys, etc., most often through the month.

There are certain disease organisms that die so quickly after bring discharged from the body that infection by dust is most improbable. Examples of this are the B, influenzae, the menings was and the generowns.

Epidemic ratarrh spreads so rapidly in epidemics that the eridence is stronger in this disease than in any other that it may at times be sirtorne; but it is more frequently spread through contact or near protantly to infected persons through coughing, sneering, etc., or from handkerchiels, clothes, drinking utenalls, etc., which have been in contact with patients.

General Care.—In most of the contagious discusses discussed in the following pages the infectious agent is confined to the discharges from the patient's mouth, near, threat, ease, sure, spottum or glaids. If the spend of these discusses is to be prevented, thus poison should be destroyed as soon as it leaves the body. The physician who is in charge of a patient with an infectious discuss has a responsibility, not only to the patient and those in immediate contact with him, but to the community. As the same general directions should be followed with all severe communicable discusses, they may well be outlined in this introductory shapter.

The Sick-room.—One with good light and air, so situated as to be easily shut off from the rest of the house or apartment, should be closen. An open fire and an adjoining both-room are very desirable. Curpets, rugs, upholetered furniture and all hangings should be removed. Only the simplest and most necessary furniture should be left behind and such books or toys as can be destroyed. An abundant supply of hot water should be provided for, a large slop jar, and plenty of old muslin and absorbent soften to be used in place of hundrerchiefs for discharges, and a supply of paper lags, in which these can be placed for removal. Free ventilation should be secured, and windows should be arrected against flies and association. The sick-room should be kept

scrapulously clean; especially should all dust be wiped up daily from floors, window-ledges, and railings, with a cloth which has been wrung from a 1-1000 hieldorid solution. The cloths used should be kept in the same solution. The bed lines should be frequently changed, and kept clean. In the room should be a large local of carbolic acid, 1 to 40, or some similar solution for cleaning the hands. There is no objection to the hanging of sheets moistened in carbolic, hieldorid, or other disinfectant solutions before the door, but neither this nor hanging them about in the sick-mean is to be segarded as having any value in disinfecting the air of the room. They create a false sense of occurity, and often lead to the neglect of thorough chambiness.

The narro should wear a washable cap and gown, which she should remove on leaving the room. Bulder gloves are an added protection in severe infections. The nurse should not out in the sick-room.

The physician, before entering the sick-room, should remove his cost and don a cap and gown, kept hanging outside the sick-room for his special use. He should carefully wash his face and hands before leaving the room.

The perticut being the source of infection, special care should be taken with everything which comes in contact with him. The outer clothing, worn when he was taken ill, should be exposed to sunlight for at least one day and thoroughly brashed in the open air. Underclothing should be boiled for ten minutes and placed in a 5-percent solution of carbolic acid. Bed-linen should be scaled in the carbolic solution and beiled in scapends before going to the general wash. Handkerchiefs, if med at all, should be treated in the same way. If there is much sputum it should be received in paper cups, which should be burned, or in vessels containing 5-per-cent solution of carbolic acid. All discharges from the mouth, pose, eves and ears should be collected on old muslin or absorbent cotton, thrown into paper lags and burnel. Handkerchiels should not be used for this purpose. Special disinfection of discharges from the lowels is not needed in the diseases treated in this Section, except in the cure of typhoid cases. All remnants of food should be burned. All dishes, knives, forks, spoons, etc., should be boiled in scapsails and used only by the patient. At the termination of quarantine the patient should receive a complete and thorough bath, including the hair, with seap and water, and entirely clean elathing put on in an adjoining room. Especial care should be given to cleanliness of the mouth and teeth.

The room subsequent to the illuser should receive the most thorough cleaning. Floors, woodwork and furniture should be thoroughly scrubbed with soap and but outer, walls should be wiped down with damp cloths urning from 1-1000 highlarid solution. After severe infortions like searlet fever and diphtherts, repapering or repainting should be done. Toys and books used in the sick-room should be destroyed as sent to hospitals where similar infections are treated. The mattress and translets should be sent to a steam disinfecting place, if one is available; if not, they should be exposed for two or three days to sanlight and beaten in the open air, to remove all dust. All washable bedding should be treated as heretofore mentioned. Not only the sick-room but the adjuming room much used by attendants should receive special cleaning. Funigation will be quite unnecessary if the above directions have been thoroughly carried out. Its value has always been problematical; it is now rapidly being abandoned by health authorities. Its effects is in on way to be compared to the special cleanliness heretofore emphasized.

CHAPTER I

SCARLET FEVER

(Scarlatina)

Scanner reven is an acute, contagious, self-limited disease, one attack annully protecting the individual through life. The period of incubation is usually from two to five days; that of invasion, from twelve to trenty-four hours; that of emption, from four to six days; that of deequamation, from three to six weeks. The disease may be communicated at any time from the first symptom of invasion and even during the existence of purulent discharges from the nose or other muceus or serous membranes. It is usually selected in by comiting, fever, and sere throat, and a characterized by an crythematons such appearing first upon the nack and spreading rapidly over the entire body. Its chief complications are office, adenitis, and membraneous inflammations of the pharyus, which frequently extend to the nose, rarely to the larges. The most important sequelae are office and nephritis. The constancy of the throat infection in scarlet fever strongly points to the pharyux as the point of entry of the infection.

Etiology,—Analogy leads to the belief that scarlet fever is due to a microorganism, but as yet its nature has not been discovered. The complications are usually associated with the development of a streptococcus. Some have gone so far as to claim that a streptococcus is the cause of the discuss. From present knowledge, however, it appears rather to play the rile of a secondary or accompanying infection, for the development of which the mineous membranes of a person suffering from scarlet fever seem to afford most favorable conditions. To the streptocorrus may be ascribed the membranous inflammations of the tonsils and pharynx, the otitis, the inflammation of the lymph nodes and the cellular tisons of the neck, and probably also the nephritis, endocarditis, ptermonis, and joint lesions. In many of the above conditions the streptococcus is associated with other pyogenic germs, and in some cases with the diphtheria building.

Presiressition.—The susceptibility of children to the scarlatinal poison is much less than to that of messles; still, it is much greater than that of adults. Billington (New York) records observations made in twenty-six families living in tenements where little or no attempt at isolation was made. In these families there occurred forty-three cases of scarlet fever; but forty-seven other children, although unprotected by previous attacks and constantly exposed, did not contract the disease.

Johannessen reports that of 185 children under lifteen years who were exposed, Iwenty-eight per cent contracted the discuse; while of 314 adults, only five per cent contracted the discuse. It may be stated that, approximately, not more than one-half of the children exposed take the discuse. The susceptibility is slight in early infancy, but it increases until about the lifth year, after which it steadily diminishes. Both sever are equally liable to scarlet lever. Epidemies are more frequent in the fall and winter than in summer, and cases occurring in the celd months are apt to be more severe. Whitelegge, in 6,000 cases, found the highest mortality in the month of October; and in Caigor's report of 1,00s cases this was also the month showing the greatest mortality.

Jaculation.—Of 113 cases an which the period of incubation could be accurately determined, it was as follows:

24 hours or less	6 cauce.	& days.	2 cases.
2 days L		9	5 .
3 *	9 4	11 *	Tenen.
4 *		H * nimmonimum	
5 "	6 4	23 *	1 3
6 k		_	_
7	5 4	1	13 cases.

Thus in eighty-seven per cent of these it was between two and six days, and in sixty-six per cent between two and four days. Speaking generally if, after exposure, a week pusses without symptoms, the chances of infection are very small. A short incubation is more frequently seen in severe than in mild cases.

^{&#}x27;Part of these are from personal observation, but the great majority are isolated cases scattered through medical literature, occurring under streamstances which made it possible to determine the exact length of the incubation period.

Mode of Infection. The shiel source of infection is the patient himwif. It is the mild and unrecognized cases which act as earriers to which the stread of the disease is very frequently due. It is somewhat dealthi whether the poison of scarlet fever can be conveyed by the breath, but infection is chiefly by discharges from the miscons membranes involved. Whether it can be conveyed by the scales during desquaration or by the exerctions of the patient-urine, feces and perspiration-is a question of grave doubt. It has not been demonstrated. Infection may take place from the carpets or furniture of the nicknom and from the clothing of the patient. Tays or books may be earriess of the disease. A brought of thesers and from a sick-room to an institution has been known to be a vehicle of infection. Cals, does and other domestic animals in sure instances have conveyed the disease. Searlet fever is sometimes spread by milk. The simultaneous occurrence of a considerable number of cases in a community should land one to suspect the milk supply. All of these sources of infertion are relatively infrequent.

The transmission of the disease through a third person is not frequent, but numerous instances of it are on record. The persons much likely to carry it are the nurse and the physician, the latter surely unless there has been very direct contact with the patient, and when the interval before seeing the second child is about. The transmission of the disease by one who, although living in the house, does not come in

contact with the patient, is extremely improbable.

Duration of the Infective Period.—There is no evidence to show that the disease is communicable during the period of incubation. It is slightly contagious from the beginning of invasion, before the sale appears. Infection appears to be most active at the height of the febrile

period-from the third to the fifth day.

In simple cases, the average duration of the contagious period may be placed at five weeks, or until discharges from mucous membranes of the nose and throat, the ears and glandular sinuses have coased. The infectious nature of those discharges has not been sufficiently recognized. One case is recorded in which scarlatina was communicated through a purulent most discharge after steven weeks, another in which the opening of a post-scarlatinal empyema in a surgical ward was followed by an outbreak of scarlet fever.

In winter especially, a chronic pharyageal catarrh may long contain the infective agent. Ashly found, on careful investigation, that from two to four per cent of patients discharged from a scarlet-force hospital subsequently conveyed the disease. There is particular danger from a child who has recently had the disease sleeping with other children. Line receds a vacc in which the disease was contracted in this way after fourteen weeks. It is impossible to say that at any specified time absolute safety exists. All patients before being discharged from a hospital or released from quarantine in private practice, should be carefully examined as to the condition of the mucous membranes, and quarantine continued as long as catarrial inflammations are present. The poison of scarlatina clings more tenscionsly to electing, upholstery, and apartments than that of any other infectious disease, possibly excepting tuler-rulosis.

Lesions.-The only characteristic besides of scarlating are those of the skin and the truccus membranes of the mouth and threat. The skin is the sent of an acute dermatitie of variable depth and intensity. There is first acute hyperemia, followed by an exudation of serum and cells in the curium, especially about the blood-ressels and lair follides. There results a death of the epidermis which is thrown off in the dosquamation. The trucous membrane of the mouth, tongue, and throat is the sout of a catarrhal, membranous, or gargrenous inflamoustion which rarely inrades the larger, but very frequently the middle our and nose. The entire escolugus is often the seat of an intense congestion. From the car the infection may extend to the mustoid cells, the meninges, or the brain, and from the nose to the accessory sinuses, particularly the antrum of Highmore. All the lymph nodes about the neck may be involved, the infection ending in coll-hyperplasia, suppuration, or necrosis. The cellular tissue of this neighborhood may also become inflitrated, this being followed sometimes by suppuration and occasionally by gangrens.

The most constant change throughout the body, according to Pearce, is hyperplasia of the lymphoid tissue, which is seen everywhere. The other lesions are degenerations due to the scarlatinal person alone, or in conjunction with the various forms of accountry infection, or to the latter alone. The most important are: fatty degeneration of the heart; areas of focal necrous in the liver; acute degeneration of the bidney or scate diffuse nephritis; proliferation of the cells of the Malpighian bodies of the spleen; templopusumonia, gangrens, or aboves of the lung; plearisy, which is eften paralent; endocarditis, pericarditis; abscesses in the cellular tissue and inflammation of the joints. These visceral changes will be considered more fully under Camplications.

Symptoms.—I sension.—As a rule, the invasion of scarlet fever is alread, the symptoms of the unset usually being directly in proportion to the averity of the attack. In the majority of cases there is constring, a rapid rise in temperature, and soreness of the throat. Often the comiting is repeated; it is frequently farelike, and without names. In severe cases the rise in temperature is very rapid, to 104° or 101° F.;

in the mildest cases it may not be above 101° F. A child may complain
of corcases of the throat, or the throat syneptoms may be entirely objective. In most severe cases there is a uniform erythematous blush
covering the pharyux, toneils, and faters, but on the hard polate it appears as mirets red points. The appearance of this is metally coincident
with the rise in temperature. Occasionally membranous patches may be
seen upon the toneils the first day, but generally not before the third
or fourth day. In mild cases the throat shows only a very moderate
congestion. Severe cases are sematimes inhered in by convulsions,
capacially in very young clothers. Diarries is not uncommon in
sommer. There is general prostration, which is directly proportionate
to the height of the fever.

Eraption.—This availty appears from twelve to thirty-six hours after the first symptoms of invasion) exceptionally, not until the third are even the fifth day. A later appearance than this is somewhat doubtful, for the such not infrequently resolve and reappears, having been overlooked in the first instance. In 108 cases inbulated the duration

of the rash was as follows:

Two days or less,	cupat
Three to seven days	
Eight to eleven days	
Over elevan days	
Returning	-

These figures are confirmed by the observations of most writers, that the rish lasts from three to seven days. The full development of the rash is generally seen in from twelve to twenty-four hours from its first appearance, and not infrequently the whole body is covered in the course of four or live hours. Its first appearance is almost avariably upon the neck and chest. Its color is red rather than searlet, and on close inspertion it is seen to be made up of very minute points upon a realtish ground giving the appearance of a uniform blinds; or the background may be wanting and only the punctate eruption shows. These points are the papillas of the skin and hair follicles. The rash usually covers the entire body except the face. Even in cases with intense emption the central part of the face usually escapes, though elsewhere the couption may be no bright as upon the body. There is often a peculiar pallor about the mouth which is characteristic. The appearance of the eruption in dark-skinned races is much modified and often diffcult of recognition. In the negro the pulms and soles may be the only places where the eruption can be distinguished. Here may be sen a bright red blush or a fine papular graption.

Variations in the eruption are very frequent and very puzzling-

They occur especially in the mild and in the most severe cases. In the mild cases the rash is not seen upon the face; it is often faint upon the body, and may be present only upon certain parts; when the rash is faint or searly it is usually most marked in the groins and avillae, or over the buttocks and luck of the thighs; it may last only one day, and sometimes may be so slight as to escape notice altogether. The ernotion may be about in some very mild cases, in certain others where the throat symptoms are severe, and in malignant cases. In the very setters cases many irregularities are seen, both as to the time of the appearance of the emption and its character. Sometimes it occurs as large, irregular patches; again, it is macular, closely resembling the rash of measles. Not infrequently an emption of fine vesicles is seen, especially on the chest, axillae and abdomen. It is seen both in mild and severe eases. A well-developed bright rash indicates strong heart action, and a sudden recossion of the rash is a sign of heart failure. Often a rash which is faint and doubtful in character may be brought out fully by a hot bath.

With the eruption at its height, there is intense itching or horning of the skin, and in severe cases considerable swelling, chiefly noticeable upon the hands and face.

Draguagation .- Shortly after the rash has failed, about the eighth day, there begins an exfoliation of the dead epidermis, known as desoramation. This is even more characteristic of the discuse than is the rash. It is usually first seen upon the neck and chest, where it appears as fine flakes. The desquaranties of the trunk is completed in from one to three weeks. If boths and immetions are being used, it may be scarcely perceptible. It continues longest where the epidermis is thickest-rin, upon the hands and feet-and here it lasts from four to seven weeks, and not infrequently eight weeks. The appearance of the fingers and toes during desquamation is characteristic. The finger tips usually peel first, and the new epidermis is pink and fresh-looking, while that which has not yet separated is of a dail gray color and loosened at the margin. Occasionally the epidermis of a considerable part of a flurer may be leasened at once, so that a partial east may be thrown off like the fager of a glove. Sometimes the patient comes under observation. for the first time during desquamation, the history of the early symptoms being doubtful or absent. Such desquaration as has been described, occurring both upon the hards and feet, may be regarded as conclusive evidence of marlet fover.

The Mild Cases.—The symptoms may be so slight as to be entirely everlooked, nothing being noticed until desquamation occurs. Usually, however, there is a rather abrupt invasion, with veniting and a temperature from 100° to 103° F. The tonsils and pharyax are congested,

while the palate shows a punctate reduces somewhat like the cutaneous symptom. The papillas of the tip and borders of the tongue are unlarged. Nearly always within twenty-four hours the rash makes in appearance, generally first upon the neck and chest. Very often it is not seen upon the face, but is abundant on the rest of the body. The rash fades on the third or fourth day, and has disappeared by the fifth day. There is very little prostration, the child often being with difficulty kept in bod.

The highest temperature is coincident with the full emption, and is noughly seen during the first thirty-six hours of the disease. It gradually falls to normal by the third or fourth day. Some examples are shown in Fig. 152. In the mildest cases the temperature may never be above 1007 F.

Desquaration is often faint over the body, but is usually unmistal-



Fig. 152.—Mino Scanar Ferms. Three cases occurring successively in the start family. Diagnosis not made used the third case developed, at which time the first one was found to be describeding in a topical season.

able over the bands and feet, always being most marked where the eruption has been most intense.

The mild cases are availly ancomplicated, but the possibility of stitic and of late asphritis should always be kept in mind, as those may occur even with the mildest attacks. The difficulties in diagnosis in mild attacks of scarlet fever are often great. It should be remembered that these cases are just as contagious as severe ones, and that from a mild attack a severe one is often contracted. It is frequently by these mild cases that this disease is spread in schools. In dispensaries, patients desquamating from scarlet forer are often seen who had been attending school regularly up to the time when they were brought for treatment for nephritis.

2. Cases of Moderate Severity.—The onset is sublen with veniting which is usually repeated, rarely with convulsions. The temperature rises rapidly, and by the end of the first twenty-four hours has racked 104° or 105° F. The rash generally appears within the first twenty-

four hours, and its intensity is usually in wheet proportion to the senerity of the attack. Appearing first upon the neck or chest, it extends rapidly, sovering the entire trunk and extremities, often in a few hours. It is generally typical in appearance, being made up of minute points, but giving the appearance of a uniform blush, which has been compared to a builted lobster. Little change takes place in the rash for four or five days. After this it fades quite rapidly, and disappears by the statle or seventh day.

The throat resembles that of the mild form, except that the redness is more intense and there is slight swelling of the tonsils, fames, and avula, and often pain upon swallowing. Occasionally small yellowish patches are seen upon the tonsils by the second or third day, but these can be wiped off and are not distinctly membranous. There is usually

a molerate discharge of a seco-puralent character from the tose. The lymph glands at the angle of the jaw are enolled and quite tender. The torgue may be coated in the center and show tright red points at its barders and tip, or it may be quite red and show everywhere the

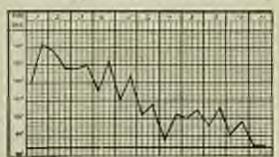


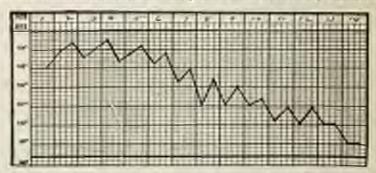
Fig. 152.—Tracean Temperatures Course or Unconringues Science Player or Medicate Sevents. Girl three years old.

prominent papillae—the "stranberry tongue"; while not oxclusively seen in scarlatina, this is of considerable diagnostic value. It is rarely seen before the third day, and may continue several days or even weeks.

During the bright of the fever, restlessness, thirst, and, not infrequently, elight delirium are seen. The temperature usually reaches the maximum by the second day, and falls gradually, but even in uncomplicated cases the fever often lasts from ten to fourteen days (Fig. 153). The pulse in the early part of the disease is rapid, its frequency being usually out of proportion to the height of the temperature. There is much prostration, frequently followed by quite a marked degree of anemia.

This form of the disease rarely proves fatal apart from complications. The complications seen most frequently in this form of searler ferrer are adentic, critic, and pneumonin. Nephritis is the only common sequel.

3. The Severe Cases.—The severe type of soutlet fever usually declares itself from the beginning. The inculation is short, and the full rash may be seen within a few hours after the initial symptoms. It is usually intense and covers the entire body, even including the face. In other cases the scuption is delayed, often sensity, and may disappear in a few hours. The disease assumes one of two fairly distinct types; one is characterized by the severity of the general toxemia, the other by the predominance of the threat symptoms. In the first group the toxemia is shown by the height of the temperature, the severity of the nervous symptoms, and the prefound cardiac depression. The temperature quickly rises often to 195° or 196° F., and usually remains steadily high matif the death of the patient. The nervous symptoms are great prostration and delirium, which is sometimes active, but more often low are instrucing. The pulse is very rapid, 190 to 180 being not uncommon; it is weak, compressible, often irregular, and the mineral sounds of the heart are fields. The urine is scanty and almost invariably albuminous.

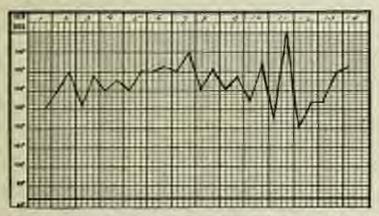


Pir. 154.—Terrona. Tracremorate. Craves on Savana Seasons Frank Essass in Recovery. Prolonged course due to severe throni symptoms lasting from second in sixth day, otherwise tracseptionsel: but involve years old.

Hemorrhages from the mouth, the ness, or other mucous membranes are occasionally seen. The duration of the disease in this form is generally from free to seven days. Exceptionally the symptoms develop with greater intensity, and death follows in three or four days. A shorter duration than this, the so-called malignant searlet fever, is rare.

In the second group with predominant threat symptoms, the first three or four days may show nothing more than cases of the moderate type. Membranous patches appear upon the tensis and spread to the soft pulate, availa, and pharynx, sensitives to the nose and through the Eastachian tube to the ear, very mody involving the larynx. The mucous membrane of the mouth is intensely composed, and often partly covered by membrane; there are sordes on the lips and teeth, and there may be superficial ulcers, which bleed readily. The glands of the neck seell rapidly, often to a great size, and the callular tissue about them is infiltrated. The head is thrown back to relieve the dyspnes which the pressure from this swelling occasions. There is an abundant discharge from the nose and month; the breath is very offensive. The general symptoms are those of a severe septioemia. The temperature is steadily high, usually between 10.3" and 105° F., for about a week, after which in cases ending in recovery it slewly falls unless complications develop (Figs. 154, 156, 157); but even in uncomplicated mass the fever constitues continues for three weeks. In fatal cases the temperature may be steadily high till death (Fig. 155), or it may fluctuate widely. The pulse is rapid, weak, and irregular. There is complete ancevia. There is low delivious or apathy, and sometimes all the symptoms of the typhoid condition are present.

Signs of a broach-procumonia may be found in the chot, and by



Fac. 135—Sevena Science Freez, Science Twee; Duarn or Forestream Day, Intense angine, outle, nephritis, recreate inflammation of revised Symph glands; girl seven years old; death from heart inflam.

the end of the first week or early in the second, acute utitis often develops. The nrine is rarely free from allowing, but the amount present is not neually great; there may be ligaline and epithelial casts, and sometimes blood. In some cases the throat symptoms predominate; in others, these of general sepsis, but more frequently the two are combined and are directly proportionate to each other. In still other cases, instead of the membranous inflammation of the throat, it may be of a gangrenous character, and extensive sloughing may take place in the pharyax or the cellular tissue of the neck, sometimes exposing or even opening the great vessels.

The duration of the symptoms in cases with severe angina is from even to fourteen days. There is increasing prostration and finally a septic stupor, with death from exhaustion, from heart failure, or from some complication—bronchopseumonia, pleurisy, nephritis, hemorthages following sloughing, pericarditis, or endocarditis. In cases which recover, the acute symptoms marry always continue for a full month; and after escaping the dangers of aspets and the early complications, the child has still to run the gauntlet of all the late complications replicities, passumonia, emberacilities, pycunia, etc. A case may prove fatal as late as the end of the seconth week; nearly all each results are due to applicitie or to its complications.

i. Surgical Scarlet Ferer.—The existence of a special form of scarlet fever occurring in patients with recent womals or those who have been subjected to surgical operations, while stoutly maintained by several scritters, has been vigorously denied by others. The question is one difficult of solution on account of the close similarity at times existing between the symptoms of scarlet fever and sepsis, and the necessity of deciding in an undoubted case whether the infection with scarlet fever was dependent upon or coincident with the wound.

Hamilton, from a study of 174 reported cases, reached the concincion that people of the existence of a special form of scarlet fever rests upon the reports of cases, usually meager, and careful analysis of these would lead one to consider them rather as septic, than as scarlatinal infections; that when there was undoubted evidence of scarlet fever, there was no proof that it was in any way due to the concident wound, and that there is as yet as convincing proof in the literature that surgical scarlet fever is soything more than scarlet fever in the wounded. On the other hand, there have been observed clinically cases which seem to admit of no other reasonable explanation than that an abmoirs of the skin, a recent wound, or even possibly a varicella vesicle, may be the point of entry of the scarlatinal infection, instead of the more usual portal, the pharenx.

Relapses, Recurrences, and Second Attacks.—As a rule, one attack of scarlation gives immunity through life. The exceptions are very few, but are well audienticated. We have seen but once an undoubted instance of a second attack in the same individual.

Belapses or recurrences within a brief period after the first attack are more frequent. There are to be excluded the cases of pseudo-relapses in which the mid, having temporarily subsided for two or three days, suppears; also those where the rash varies in intensity from time to time; and, lastly, the cases in which, according late in the disease, it is due to septicemia or pyemia. They are comparable to the relapses of typhoid force. They occur most frequently during desquamation, between the screenth and twenty-fourth days. There may be not only a new cruption, but a rise of temperature, sore throat, and vaniting, just as in the initial attack. These recurrences are sometimes aborter and midder than the first attack, but this is by no means emiliarm, since Korner mentions eight cases where the excend attack proved futal. In considering the subject of accord attacks, the hability to errors in diagnosis must be been in mind and only cases included which have pre-

serard typical symptoms.

Special Symptoms, Complications, and Sequelae.—Temperature.— The temperature surve of this disease is quite characteristic. There is usually seen an absorpt rise, the maximum being reached on the second day; there follows a period of variable duration, generally lasting, according to the coverity of the case, from two to five days, in which the fluctuations are very marrow; then a gradual decline to normal, which is reached in the milder cases in about a week; in those which are more severe, in about two weeks. This typical curve (Figs. 151 and 152) is seen to the great proportion of micomplicated cases which end in recovery. Dentations from it, therefore, are important as indicating that some complication exists. The explanation is usually to be found in the development of otitis, admittis, nephritis, pneumonia, etc. Severe throat symptoms prolong the temperature but do not usually mostify its course. In very severe cases ending fatally the high temperature is prolonged. In any case, a rise after the third day is unfavorable.

Thread.-Three distinct forms of augina are seen in searlatina : sim-

ple or crythematous, membranous, and gangrenous.

4. Erythematous Angina.—This can hardly be ranked as a complication, as it is nearly as constant as the scarlatinal rash. Usually there is only the intense general blash over the entire plurynx with the fine red points upon the hard palate; but there may be seen upon the tonsils grayish-yellow spots resembling those of follicular tonsilitis, which can be wiped off, leaving a clean surface. This simple angina is at its height with the maximum temperature, and fades as the temperature falls.

 Membraneus Angina.—These cases were formerly classed as scarlatinal dightheria. Cultures, however, have shown that the great majority of these inflammations are not true diphtheria, but are due to the

streptococcus.

The become of this form of anging are considered in the chapter of Membranous Tonsillitis. Usually on the second or third day of the disease an explation appears upon the tonsils, and in the milder cases it covers only the tonsils. In the most severe form it may be seen within tenty-four boars of the anset, conscious before the cruption appears. Beginning upon the tonsils, the membrane rapidly spreads to the entire plarynx, the museus membrane of the sore, the mouth, the Eustuchian tube, and cross to the middle ear. In refor it may be gray, greenish, or almost black. The infiltration of the cellular fisone of the neck and the enlarged lymph glands produce great external swelling, which may extend like a collar from ear to ear. The breath has a foul oder, the mosal discharge is thin and letel, and mosal respiration is obstructed, so that the mouth is open constantly. It is surprising that the largue is so seldom invaded:

These local changes are accompanied by constitutional symptoms of great severity, which are due to a general streptosoccus explicenta; bronchoperamonia and nephritis are very frequent, oticis is almost constant, and supportation of the lymphatic glands is not uncommon. The creation is aften irregular and late in appearing.

The frequency with which diphtheria coexists with availatina varies greafly. In hospital practice the proportion often runs as high as thirty or forty per cent. In private practice it is much lower. The streptococcus angina is somelly seen at the height of the disease; true diphtheria may occur at any time, even during contalescence. The only position means of differentiation is by cultures, which should invariably be made from the throat of every putient admitted to a scattlet-fever hospital, and of every case in private practice showing any candate upon the torsels.

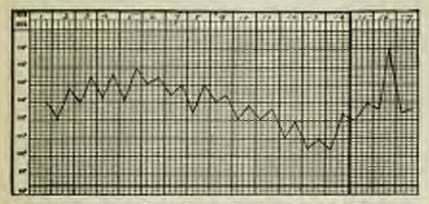
3. Gaugemons Angina.—This is seen only in the worst cases of scarlet fever. The process may be gaugemons from the outset, or preceded by a membraneous inflammation. It is sometimes insidious in its development. There is a fetod offer to the breath, an irritating discharge from the nose and month, with very great glandular swelling. The tonsils are gray or grayish-black in color, and large masses of neurotic tissue may be removed with the forceps from the tonsils, usula, fauces, or planyins, and sometimes abrughing occurs in the cellular tissue of the neck. Blood-twoods of considerable size are sometimes opened, and serious or even fatal hemorrhage may result. The constitutional symptom are those of great authoria, prostration, and profound cacheria, followed almost invariably by a fatal fermination.

Lymph Nortes.—These are smolless in all cases accompanied by sovere angina. The inflammation may be simply an acute hyperplasia, or it may go on in suppuration and necrosis. Abscess does not often occur at the height of the disease, but the early and ling may almost completely subside only to recur, and suppuration may take place even as late as the fifth or six week of the disease. It may be confined to the glands or be complicated by suppuration in the cellular tissue of the neck.

Cellulitie of the Neck.—This usually occurs toward the end of the first week, and is associated with grave throat symptoms. Rapid and extensive inditration occurs, the skin becomes tense and brawny, the head is held back, and there may be considerable dyspass. The infli-tration may be only in the neighborhood of the lymph glands or it may be diffuse. Unless relieved by early incision, the diffuse form may result in supportation and extensive slenghing, which may be deep

enough to lay have the large vessels of the neck. This is a complication of the gravest possible import. Death may occur from septicemia before or after alonghing or from homorrhoge due to opining by alceration of the external mostid or some of its branches; or there may be associated thrombosis of the jugular vein, leading to thrombosis of the lateral sinus, maningitis, or possitis.

Ears.—The ofitis is due to direct extension of the infection from the rhinopharyax. It is the most frequent complication of scarlatina, and in doubtful cases may have some diagnostic importance. As a rule, the younger the child the greater the limbility to ofitis. It is more frequent in winter than at other swavns, and is closely connected with the severity of the thront symptoms. Of 1,397 cases reported by Finlayson,



Fro. 150.—Sevent Scatter Fevers: Orient, Macoustres; Davita. Typical symptoms and temperature curve until fourteenth day; secondary rise of temperature from attitus; double pursuentesis on the fifteenth day; macteid operation on the sixteenth day; death twelve hours later from segmentar; boy five pears old.

stitis occurred in 10 per cent, and of 1,008 cases reported by Caiger, in 13 per cent. In Burkhardt's statistics the proportion was as high as 23 per cent. Of cases accompanied by severe throat symptoms utitis is present in fully 25 per cent.

As a rule, both care are affected. Otitis is most frequent early in the second week, but may occur at any time, even during convalescence. When it develops at the height of the disease there are in some cases as new symptoms; in others there is pain and deafness and a rise in the temperature, which may fall after paracontesis or rupture of the drum membrane, or there may be extension to the mastoid (Fig. 156). The stitis is aften overlooked unless the ears are regularly examined. The form of inflammation may be extension to purulent, the latter being often accompanied by necrotic changes.

Beastd makes the following report upon 185 cases showing the dis-

astrons consequences of scarlatinal action. "In 30 there was entire destruction of the membrana tympani; in 50 the perforation comprised two-thirds or more of the membrane; in 15 there was total loss of hearing on one side, and in 6 of the cases upon both sides; in 72 of the cases the hearing distance for low voice was loss than twenty inches."

As a cause of permanent dealness and deal-mutian, no ducase of childhood compares in importance with searlet fever. May has collected statistics of 5,615 deal-mates, of whom 182 ownlither condition to editis following searlet fever.

Kelveys.—Alternimum accompanies nearly all the severe case of scarlet fever. In many this is simply the ordinary febrile alternativa due to acute degeneration of the kidneys. In those with severe throat complications, and in nearly all the septic cases, there is an acute definnephritis; the interstitual changes may be very marked and the kidneys



Fig. 157. Seconds Favors on Monometra Seconds Forgonia by Favor Newscon-Early symptoms typical and encomplicated, towarts-first day consisting: towarts-fifth day inverse convenience; death towarty-shifth day. No droper; units have below 10 connect in twenty-four heater; girl less years old.

contain sample abscesses. This occurs at the height of the febrile process and is rarely assompanied by dropsy; but albumin, casts, and even blood may be found in the urine. The most severe and the most characteristic renal complication, and that generally designated as post-confedical nephritis, is a diffuse nephritis, with changes in the glomeruli as the most striking feature. It neually develops during the third or fourth week of the disease, and may follow mild as well as severe cases (Fig. 157). The onset may be gradual, with dropsy and urinary changes, usually accompanied by a slight rise of temperature; or it may be abound, without dropsy but with convulsions, suppressing of urine, and very high temperature.

The characteristic urine is of a reddish or smoky color and analy. It contains a large amount of albumen, often sufficient to reader the urine solid upon boiling. Under the microscope there are seen red blood-cells, put cells, epithelial cells, and casts of every variety. Death may take place from acute urentia, or the attack may be followed by permanent damage to the kalmays. It is more fully described with the Dosaces of the Kidner.

Joints.—Acute articular rheumatism may occur coincidently with the development of the scarlatical rash, and occasionally during convulencence in patients who have a predisposition to that disease. Acute srelling of the joints is sometimes of pyemic origin. In pyemic arthritis the large joints are usually involved and the lesions are apt to be multiple. Joint disease may occur as a sequel of scarlet fever, when it is secondary to disease of the bone or to periarticular abscesses opening into the joint.

The foregoing include but a small proportion of the joint complications een in earlet fever. The most frequent and most characteristic form of inflammation is scarfolived synonics, often improperly called cordatinal rheumation. It occurs in different spidemics with varying frequency. Carelaw (Glasgow), in 533 cases of scarlet fever, met with synovitis in 60 patients. It is seldom seen in children under three years of age, and is most frequent after five years. It may occur in mild as well as in senere cases. According to Ashby, exporitis develops toward the and of the first or the beginning of the second week. The symptoms are generally mild, and are followed by prompt recovery. Supportation is rare. Any of the joints may be attacked, but those of the wrist, handellow, or knee are most frequently affected. The symptoms are redness, moderate pain, swelling, which is usually due to synorial distention, and conclimes a slight rise in temperature. The duration is generally but three or four days, and in most cases there is spontaneous recovers. Besides these milder cases there occurs a much more severe form, which may develop later, even during convalencence. It is not very armle, but is accompanied by fever, and both the fever and swelling may continue for many weeks. Recovery may be complete or some joint disability. may remain and chronic arthritis may follow,

Lungs.—The pulmonary complications of searlet fever are neither as frequent nor so important as these of measles. Brenchopneumonia is usually found at autopsy in septic cases where death has occurred later than the third or fourth day, but it is not generally recognizable

us carly by physical signs.

In septic cases pleuropaeumonia sometimes occurs early in the disease and at other times late, generally associated with nephritis, but occasionally without it. It is not infrequently a direct cause of death. Empyona may follow pleuropaeumonia or occur with pyemia or nephritis, but with the latter, simple serous pleurisy is more common. Edema of the large occurs chiefly with nephritis, in which it is the most common cause of death.

Heart,-Cardiac murmum are frequent at the height of the disease;

in fact they are heard in almost all severe cases. Endocarditis and pericarditis are oftenest seen in septic cases, and with post-scariatinal asphritis. Endocurditis now be simple or malignant, and may lead to embolism during convalescence. Some depenerative changes in the captiamuscle are probably present in all the sovere cases. Acute dilutation may result, which is sometimes a cause of death.

Blood,-In all cases there is a rapidly progressing anemia that lasts into convalescence. The reduction in the red cells in an average case is about one million. The shief interest, however, attaches to the number and character of the white cells. In mild cases there may be only a moderate increase in their number, usually to from 10,800 to 14,000 It is in cases of molerate severity that the characteristic changes are found. In these there is a decided leucocytosis which appears early, attains its maximum about the fourth day, and gradually declines until the normal is reached, which may not be until the third, fourth, or fifth week. The maximum is usually about 30,000 to 35,000; although it may be as high as 75,000. During the first week the polymorphometeur neutrophiles form from 10 to 95 per cent of these cells; the cosmophiles as well as the lymphocytes are diminished. After the fifth or sixth day, there is a rapid increase in the cosmophiles which attain their maximum -sometimes 20 per cent of the total lescocytes-between the fourteenth and twenty-first days. After the third week they gradually diminish. Exceptionally there is found in convalencence a relative lymphocytosis, which may be as high as 10 per cent. Complications, nephritis excepted. usually cause actual as well as relative increase in the polymorphomiclear neutrophiles. In malignant and rapolly fatal cases there is usually a very small proportion of cosinophiles, and little if any leucocytosis. though exceptionally it may be high. Much has recently been written regarding the so-called "inclusion bodies" which are found in the bucocytes in this disease. It seems clear that they are not specific and that their presence is not diagnostic of scarlet fever. They are reguharly found in all but the mildest cases before the fourth day; but they are found also in other conditions, e. g., pneamonia, sepsis and erysipelus.

Digastics System.-Functional disturbances are very frequent, and, in fact, are seen in most of the cases, but arganic changes are race. Vomiting is the mode of easet in the majority of cases, but rarely continues throughout the attack. Diarrhea may be associated with it under both conditions. The tongue is nearly always could, and clean off in quite a characteristic way, which, with the prominent papillar, giver rise to the "strawberry" appearance. Catarrhal atomatitis is a very frequent complication, and in many cases of severe membraness argina the same process is seen in the baccal cavity.

Nerrous System.—Nerrous complications and sequelar are seen less frequently with scarlatina than with most of the infectious diseases of each severity. Convulsions are frequent at the outset, and generally indicate a severe attack, though not invariable so. Occurring late in the disease, they are usually due to uremia. Meningitis may occur as a complication of otitis, in pyemic cases, and sometimes with post-carlatinal rephritis. Paralysis from peripheral neuritis is rarely seen. Hemiplegia sometimes occurs from meningeal hemorrhage, or from embedism secondary to endocarditis and neocciated with neptritis. Charen was noted as a sequel in only three of 533 cases reported by Cardaw. In a report of 187 cases of epilepsy, Wildermorth states that it followed scarlet fever in 12 cases. Insanity has been occusionally observed, the usual form being acute manna, with complete recovery in a few weeks or months.

Gasgreen.—Cases of symmetrical gangrene after scarlet fever have been reported. The parts generally affected are the buttocks, thighs, and arms, but it may occur almost anywhere. The pathology of these cases is obscure. The process usually begins in several places simultaneously, or in rapid succession, and advances steadily till death occurs.

Other Infectious Discuses. Diphtheria is most frequently seen, and may be present even when there is no distinct membrane.

Scarlatina may also be complicated by measles, varicella, or facial erysipelas, and occasionally by variola se typhoid fever. The symptoms are often an irregular commingling of those belonging to the two diseases. They may begin simultaneously, or more frequently one develops as the other is subsiding.

Diagnosis.—The characteristic symptoms of scarlet fever are the abropt onset, usually wish vomiting, the marked elevation of temperature, the erythematous condition of the throat, the punctate eruption on the hard palate, with the appearance of the rash within twenty-four hours, and later the characteristic appearance of the tongue. The difficulties of diagnosis usually depend upon irregularities in the eruption. The variations are seen in the mildest and in the most severe cases. In the former the rash may be of short duration, often less than a day, and in consequence easily everlooked; or it may be present only upon certain parts of the body instead of being diffuse. In every dentiful case the greins, axillae, and loins should be closely scrutinized for a punctate cruption. In very severe attacks the rash may appear late or recode after being fully out, or it may be hemorrhagic or in irregular blotches. In any case, too much stress should not be placed upon the rash alone.

Until we have some exact means of laboratory diagnosis as in typhoid fever, malaris, and diphtheria, an absolute diagnosis will in

ertain cases be impossible. Sometimes the diagnosis remains doubtful until the end, although occasionally confirmatory evidence may be obtained even in convolucemen. Thus, a patient may desquamate in a number so typical as to leave no doubt as to the nature of the proceding illness; again, the occurrence of a characteristic sequel, such as nephntain the third or fourth work, may testify strongly for scarleting as the primary disease; and, finally, the outbreak of undoubled cases among children who have been in contact with the patient is practically conclusive, always provided other sources of infection can be excluded. Desgramation, however, follows so many other eruptions that when slight or irregular, one should not rely upon it as an evidence of seatlet fever, but only upon a typical exfoliation upon the hands and feet. It is a point of some practical importance not to oil the skin of a patient when awaiting desquamation for diagnosis, as this alters very much the characteristic appearances. In some purpling epidenius the length of the incubation may be of material assistance in the diagnosis; when this is regularly more than a week, one may be pretty sure that he is not dealing with scarlet fever,

Scarlet fever with severe throat symptoms and doubtful emption can be distinguished from diphtheria only by cultures. Measles is distinguished by the length of the invasion, the enterthal symptoms, and the slowly spreading emption, but most of all by Keplik's spots. Much more difficult is it to distinguish between mild scarlatina and rubella. In rubella the important thing is that, although the rush may be well marked, often covering the body, the constitutional symptoms are few or entirely absent. In scarlet fever with an emption of the same intensity there is almost invariably a considerable elevation of temperature, assults 1927 or 1937 F., and a bright-red throat.

There are so many skin eruptions which may resemble that of scarlet fever, that it is always harardous to make the diagnosis of this disease from the eruption alone. This is especially true of sporadic cases securing in infants; there is seen at this age a great variety of eruptions, usually associated with digostive disturbances, which closely simulate a scarlatinal rash; but most of them are of short duration. A scarlatiniform crythema is occasionally seen after diphtheria autitoxin, also in influenza, typhoid fever, passimonia, and varicella, which may cause them to be mestaken for scarlet fever, or may lead to the conclusion that both diseases are present. The same is the case with the septic crythema occurring in surgical patients. Belladouna, quints, and occasionally antipyrin, the salicylates and aspirin may produce stuptions more or less closely resembling that of scarlet fever. This is also true of some cases of urticaria and other forms of skin disease. Evaptions resembling scarlet fever may also arise from irritation dur

to ricthing, to feat, to be local application of irritants to the chestsuch as complicated oil, etc. There is little doubt that many of the cases reported as relapsing scarlatina are really examples of recurring erytherms, particularly as some of the latter are followed by a desquaraction which is very similar to that after scarlatina.

Pregnosis.—There is no disease in which it is more difficult to foretell the cutcomy than in searlet fever. Cases apparently of the mildest type not infrequently develop serious symptoms and even complications that could not be foreseen. Symptoms indicating a had proposes are, very high temperature, especially one which continues to rise for the first three or four days, and acvere nervous and throat symptoms. The most common cause of death is the disease itself, the scarlatinal tonemia. From this cause more than half the deaths occur. Next are the complications, earline, pulmonary, renal, cititis, mustoid and cerebral, given in the order of their frequency. The mortality of sourlet fever varies much in different epidemics. In some, nearly all the cases are of a mild type, and the mortality may be as low as 3 or 4 per cent; in others, a severe or malignant type prevails, and it may be as high as all per cent. The disease is, as a rule, more fatal in the youngest infants, becoming less so as age advances.

The following are the mortality records from various European sources:

Ashby, Marehester Bospital.	681	closes;	mortality,	12.21	-	cest.
Korea, a single epidemia	426	A	-	14.0	4	4
Bendr, Copenhagen			*	22,2	۶.	
Olivier, three Paris hospitals for five years	383			14.0	*	
Fleischmates, five epidemics	1,354		4.	10.0	-	4

The general mortality of the disease may therefore he assumed to be from 12 to 14 per cent; it is, however, much higher than this among using children, as shown by the following figures:

New York Infant Asylum.	I Di custo ti	nder.	Tyme; r	cortality	250 1	MC.	cent.
Adby, Munchester Hospital			2 .		23	4	
Bendr	not staind.				13	*	
Beshart	136 cases	4	2 -	5	30	-	
Fleichmann	not stated		4 *		43		

Under free years of age the average mortality from scarlet fover is, therefore, between 20 and 30 per cont.

Prophylaxia.—Even the mildest cases should be isolated for four weeks. If complications exist, such as ontis, thinitis, pharyagitis, empyears, or suppurating glands, the quarantine should be continued until these conditions are cared. Patients should not be allowed to mingle with other children for at least a month after all symptoms have subsided, and should be forbidden to shop with other children for three mentles. Children in the family who have not been exposed to the disease should be immediately sent away; and those who have been exposed, separately quarantized for at least a week.

After recovery, the patient, before he is released from quarantine, should have one thorough bath, the entire body, including the hair and scalp, being sorubbed with soap and water, and every particle of cloth-

ing changed.

The nurse should be quarantined with the patient, and should not mingle with other members of the family until a complete change of clothing has been made and hands and face theroughly washed. The surse and all others in close contact with a severe case should use frequently an antiseptic gargle and a most spray. The care of the room during and after the attack has been considered in the introductory pages of this Section.

Schools are hot-bods for the spread of scarlet fever. The greatest scorrees of danger are the mild or walking cases in which the disease has not been recognized, and the clothing of patients who have had a severy form of the disease. As a rule, a shild should be kept from school as weeks from the beginning of the attack, and the certificate of a physician should be required before readmission. Other children in the household should not be allowed to attend schools of any kind during the period of active symptoms; they should be kept at home on the average for a mouth. This precaution is necessary, first, because they might earry the disease from the patient at home; secondly, because otherwise they might themselves attend school while suffering from the disease in a very mild form or during the period of invasion. When the tick whild is completely isolated, the danger from the first source is very slight. During severe epidemics it frequently becomes necessary to close all schools.

In general, it is to be remembered that the danger is first from the patient, secondly from the room, and thirdly from the name. Special attention should always be given to the complete and immediate isolation of the first case which appears in an institution or community, which should apply to mild as well as severe forms of the disease.

Treatment.—There is as jet no specific for scarlet fover. The physician's dety in the average case consists in (1) establishing proper quarantine and the carrying out of adequate means of disinfection; (2) the hygienic care of the putient; (3) directing the diet; (4) matching for complications, especially critis and nephritis. It should be borne in mind that otitis is rarely accompanied by pain or temferness, and is recognized only by an examination of the care; also that severe and fatal nephritis may follow mild as well as severe cases. Mild attacks require no medicine. Children should be kept in bed at least a week after the fever has subsided, and upon a diet chiefly of milk and farinaceous food with pleaty of water for a period of three weeks. This is an important matter in the prevention of nephritis. During the height of the scruption, the intense itching of the skin may be allayed by sponging with a bicarbonate of soda solution, or by immetions with trackine, or by the free use of rice or talcum powder. Plenty of fresh air should always be secured in the mck-room. As soon as the fever and rash have disappeared, daily warm baths with scap and water should be used, after which the entire teely should be anointed with vaseline, with the purpose of facilitating desquaration.

The temperature does not usually require interference when it only occasionally rises to 104° or 164.5° F. But if there is hyperpyrexia, or a temperature which ranges from 164° to 165.5° F. or over, antipyretic measures are called for. Hydrotherapy is much safer and more certain than drugs. Sometimes sponging is sufficient, but in the great proportion of cases the suck or bath is required. The use of water in the reduction of temperature is especially indicated in septic cases with typhoid symptoms, and in those with pronounced cerebral symptoms. The temperature of the water employed will depend upon the duration of its application. It is generally better to use prolonged spanging or bathing with tepid water than water at a lower temperature for a shorter period.

The nervous symptoms are frequently letter controlled by ice to the bead and by cold sponging than by medication. Antipyretic drugs may occasionally be useful to control restlessues and premote sleep, and in mild cases to effect a moderate reduction in temperature. Phenocetin is usually to be preferred.

As soon as the pulse becomes weak or rapid and irregular, or the first sound of the heart feelds, stimulants should be given, no matter at what stage of the disease. In septic, or malignant cases, or in those accompanied by severe angins, admittis, or collulitis, stimulants should be used freely. Digitalis is especially valuable when the pulse in weak and the tension low. It may be given alone or combined with caffein; one minim of the fluid extract of digitalis, and gr. § of caffein being the initial doses for a child of five years.

The crythematous sore threat requires no treatment except the use of a bland gargle. If there is a profuse mosal discharge, gentle mosal syringing with a warm saline or horizonic solution may be used with the hope of preventing infection of the moddle our. The local treatment of the threat is the same as that of other cases of severe angina.

Milder forms of adentitis require no local treatment. When severe, the glands should be covered with inhthyol, and an ire-bag applied continuously. Poulticing almost invariably does farm. If an abscess forms, early invision should be made.

The ears of patients with severe throat symptoms should be examined daily in order that there may be no delay in performing paracenteria should this become necessary. Any unusual rise in temperature should direct attention to the mrs. The indications for the operation are the same as in other severe forms of cities.

The physician should be constantly on the watch for the development of nephritis, not only during the febrile period, but also during convalences. Repeated examinations of the arine are absolutely necessary. These are facilitated by having a rack of test tubes and the ordinary progents for detecting allounin in the sick-room, so that the physician may himself examine daily a fresh specimen of urine. The nurse should be instructed to measure and record accurately the twenty-four hours' urine throughout the attack. The treatment of scarlatinal nephritis has been considered in the chapter devoted to Diseases of the Kidney. Diffuse cellulitis of the neck calls for fire, early incidion as the only means of preventing extensive sloughing.

On the assumption that streptococci, though not the cause of the disease, are still responsible for most of the serious complications of scarlet fever, sem propured by means of several different strains of this organism have been produced and extensively used but without any uniform or striking success. One has been produced by Moser (Vienna), concerning whose affects there is much more favorable evidence. Eacherich, Bokay, and other reliable Continental observers in their reports have declared that its effects are not less striking than those obtained from diphtheria antitexim. It must be given in very large doses, from 100 to 200 c. c. The value of streptococcus scrum has not yet been demonstrated in this country.

Transfusion and the intramsocular injection of blood or of blood serrors from patients convalenced from scarlet fever have been employed by Zingher (New York) and others in very severe forms of scarlatinal toxemia. The beneficial results which have followed have in some instances been so striking that they can hardly be considered accidental. In desperate cases this should be tried whenever practicable. Considerable amounts of blood must be used, from 100 to 200 c. c. according to the age of the patient. Some benefit also under similar conditions seems to follow the injection of normal blood from healthy persons.

During convalescence, the urine should be frequently examined. Antiseptic gargles and a nasal spray should be used as long as a purulent discharge from the nose or plaryux continues. MEASLES 973

CHAPTER II

MEASLES

(Rubcala, Morbilli)

MEASTER is an epidemic contagious disease, more widely prevalent than any other eruptive forces, sery few persons reach adult life without contracting it. One attack usually confers immunity. It is highly contagious even from the beginning of the invasion, and spreads with rent rapidity from the patient to all susceptible persons exposed. The infections agent, however, does not cling to clothing or apartments as does that of scarlet fever. Messles has a usual incubation period of from eleven to fourteen days; a gradual invasion of three or four days with symptoms of an acute orrest, and a marulopapular scaption which appears first upon the face and spreads slowly over the body, and which lasts from four to six days. This is followed by a fine bran-like desquamation, which is complete in about a week. The mortality is low, except among infants and delicate children, in whom it may reach 30 or even 40 per cent. In institutions for infants and young children no epidemic disease is more to be dreaded than mensies, not only on account of its severity, but from the frequency with which, in each subjects, it is complicated by bronchoperumonia.

Eticlogy.-Little is as yet known of the essential cause of measles. Anderson and Goldberger, and since them a number of others, have succeeded in inoculating munkeys with the blood and also with the most and based secretions from patients with measles and have produced a disease attended by fever, eruption and respondery symptoms which are believed to be identical with mondex in the human subject. They have successfully carried the strain of infection by blood insculations through six generations of monkeys. The varus obtained by Anderson and Goldberger passes through the Berkfeld filter, resists drying and froming for twenty-four hours, but is destroyed by a temperature of 53° C. Blood from patients with measles was found to be infective at least twenty-four hours before the cruption and for twenty-four hours after its appearance. Later than this its infectivity is much lessened and soon disappears. The secretions from the mouth and nose were infective for the meekey only when collected during the stage of emption. The experiments suggest a rapid loss of infectivity with the beginning of convalescence. Attempts to convey the disease to animals be inoculating with scales from desquarating patients were unspeconstat.

Clinical observations indicate that the virus of measles is more readily diffused than that of most communicable discusse; also that its viability is less than most pathogenic organisms. Only a short expounce is

required to communicate the disease,

Predisposition.-Infants under six meaths do not readily contract measles, but all other children are extremely susceptible. In an epidemia reported by Smith and Dahney, 110 unprotected children, between the ages of eight and eighteen years, were exposed and only two escaped. In one institution spidemic observed by us there were 62 children over two years of age; fire were protected by a previous attack and excepted; of the remaining 57 children, 50 took the disease. There were also in the institution 113 children under two years old; of this number 78 per cent took the disease; but, although a number were exposed, not one child under six months cill contracted measles. We lute, however, seen in one instance a typical attack of measles in an infant of seven mouths, the disease having been contracted in this case from the mother. The age of the persons affected depends much upon the length of time since the last outbreak of the disease. In an epidemic occurring in the Island of Guernsey, where the disease had not prevailed for many years, all ages were affected, the youngest being twelve days old, and the oldest, a man and wife, each aged eighty years. Instances have been reported by Somer, Gautier and others in which the cruption of mousles has either been present at hirth or has developed within a few hours after birth, when the mother was suffering from the disease at the time.

Except, then, in early infancy, the probabilities are very strong that every child expend to measles will contract the disease. Occasionally, however, one is seen who seems inensceptible, no matter how close the exposure.

Epidemics of measles are more frequent and more severe during the winter and spring months. They are least frequent and milded during the number and autumn months.

Incubation,-In 144 cases, in which the period of incubation could be definitely traced, if was as follows:

Incubation :	of less than nine days	-
	* nine of ten days	
	* eleven to fourteen days	
+0 (* fifteen to reveateen days	
	* eighteen to twenty-two days	

Thus in 56 per cent of the cases the incubation was between eleven and fourteen days, and in only one case was it loss than a week. The con-

[&]quot;About twenty-five of them are taken from our own records; the remainly are mainly isolated cases, scattered through medical literature. The incubation is reckoned from the time of expenses to the beginning of manuful symptoms.

stancy of the inculation period is strikingly shown in some epidemics. Thus in the one reported by Smith and Dahney in an institution in Virginia, exactly eleven days after the rash appeared in the first case, the disease developed in twenty children—no cases having occurred in the interval.

Duration of the Infective Period.—This is much shorter than in scarlet fever, and the average duration may be placed at two and a half weeks. The minimum period of isolation should be ten days after the appearance of the cruption. It should be extended if there persist discharges from the nose and throat or a cough. Haig-Brown discharged fifty-eight cases on or before the twenty-ninth day of the disease, and in no instance was measles spread by those children. Ransom, however, records one instance in which it was communicated thirty-one days after the appearance of the rash.

Measles is highly contagious from the very beginning of the catarrhal symptoms. A case occurred under our observation in which a child conveyed the disease four days before the rash appeared; and many such have been observed. An instance is known to us where, of thirteen little girls at a children's party, only one (protected by a previous attack) escaped measles; the source of infection was a child who showed no rash until the following day. The period during which the disease is most contagious is still a matter of dispute, the general belief being that it is coincident with the most severe catarrhal symptoms and the beginning of the eruption.

With the fishing of the eruption and the subsidence of the catarrh, the communicability of measles diminishes rapidly. It is generally proportionate to the severity of the catarrhal symptoms, and when these are protracted it is probable that the disease may be communicated for a much longer period than in the usual case.

Mode of Infection.—Measles is usually spread by direct exposure to an affected person. The infectious agent is chiefly disseminated by the minute droplets which are given off during coughing and sneezing, probably also by the discharges from any affected microis membrane. Proximity to a patient seems necessary to contagion, but not actual contact. Infection from the scales during desquarantion probably does not occur. It is very infrequent that measles is conveyed through the isolium of clothing, furniture, or a third person. Though a good many instances are on record in which the disease has been carried by a third person, this, after all, very rarely happens and we think never unless the contact both with the sick and the well child is very close and the interval short.

Letieus.—The only constant bosons of measles are those of the skin and the mucous membranes, chicily of the respiratory tract. According to Neumann, the process in the skin is of an inflammatory characterbut is more superficial than in scarlet fever. There is congestion, accompanied by an exudation of round cells about the small blood-ressels, and also about the sweat and sebaceous glands, and the papillar. To this exudation and the edema, the swelling of the skin is due. It recess everywhere, but is especially noticeable upon the face.

The changes in the mucous membranes are quite as purch a part of the disease as are those of the skin. There is a enturrhal inflammation affecting the conjunctivae, nose, pharynx, larynx, traches, and large breachi, which varies in intensity with the severity of the attack. In the most severe forms in infants and in young children, this inflammation entends with great uniformity to the small bronchi, and usually to the air resides, consing beatchopneumonia. In severe cases, the beson in the pharynx and larynx also, instead of being catarrhal, may be membranous; the larynx being much more frequently involved, and the care much less so, then in scatlet fever. Freeman has described areas of focal necrosis in the liver similar to those found in diphtheria; they were present in four of twelve cases examined. The lesions of the lungs and of other organs will be more fully considered under the heading of Complications.

The bacteria which are associated with the lesions of the respiratory tract are the staphylococcus and the streptococcus, separately or together, and either form may be associated with the pacumococcus (see Bacteriology of Bronchopneumonia). Measles produces conditions in the uncons membranes of the respiratory tract which are especially favorable for the development of these bacteria. They are present in the menth in great numbers; they may cause parumonia, offits, and other local inflammations, and the paramococcus or streptococcus may produce a general septicomia.

Symptoms.—Jamesion.—As a rule, the invasion of measles is gradual, both the fever and catarrial symptoms increasing steedily up to the appearance of the cruption. The characteristic symptoms of the invasion are those of a severe coryna—suffusion of the eyes, increased lackrymation, photophobia, succeing, and a discharge from the nose. The house, hard cough indicates that the catarrhal process has involved the largus and trackes, as well as the visible mucous membranes. Frequently the patient complains of some sereness of the threat, and on inspection there is seen moderate congestion of the tonsils, fances, and pharyns. On the hard palate are frequently seen small red spots, Much more characteristic are the minute white spots upon the mucous membrane of the checks, known as Kophik's sign (see Diagnosis). The constitutional symptoms are indefinite, and may be met with in almost any disease. These are galances, hendache, pains in the back, and the

neual symptoms of malaise; there is earely comiting or diarrhes. Drowsiness is a frequent symptom, and is regarded by the laity as characteristic.

The exceptional cases in which the invasion is alread are puzzling. There may be a sudden accession of fever with vomiting, and even convulsions, as in a case lately under our observation. Not infrequently, when the disease prevails epidemically, the invasion is sudden, with high fever and pulmonary symptoms which are so severe as to mask everything also until the rash makes its appearance, the case up to that time being often regarded as one of primary preumonia or of gripps. The duration of the stage of invasion—i. s., from the beginning of the catarrh until the eruption—in 270 cases which we have analyzed was as follows:

1 day or less	6 days
2 days	7 * 0 *
3 *	8 2 .
4 =	# *
5	10 " I case.

From this table it will be seen that the length of the period of invasion varies considerably—more, we think, in infants and very young children (most of these were under three years old) than in those who are older. In the greater number of cases it lasts from two to four days.

Eraption.-The rash usually appears on the third, fourth, or fifth day of the disease-in the largest number upon the fourth day. As a rule, it is first seen on the back or behind the ears, on the neck, or at the roots of the lair over the forehead. It appears as small, dark-red spots, which are at first few, scattered, and not elevated, resembling flea-bites. In twenty-four hours the macules are much more numerous, and many of them have become papules. They frequently group themselves in cruscentic forms. They are usually scrarated by areas of normal skin, but where the rash is intense they are frequently coalescent. From the time. of its first appearance to the full development of the rash on the face. is usually about thirty-six hours, but may be from one to three days. With a full eruption there is seen considerable smelling of the face, especially about the eyes, and the features are sometimes searcely recognizable. On the second day of the rash it begins to appear upon the neck beneath the chin, the upper part of the sheet and back; on the third day the trunk is covered, and scattered spots are seen upon the extremities. The rash appears last upon the lower extremities, and by the time it is fully out upon them it has usually begun to fade from the face. In mild cases it remains discrete, but in severe once it is

frequently confluent upon the face and upon the extensor surfaces of the extremition. As a rule, it covers the entire body, even the palms and soles,

The emption fades slowly in the order of its appearance, and there is left behind, in typical cases, a slight brownish staining of the skin which often remains for a week or more. The duration of the tash is from one to six days, the average being four days.

There are many cases in which the rish does not follow the typical course described: (1) Instead of spreading gradually, the entire body may be covered in a few hours. (3) The rash may be hemorrhagic, This condition was present in about Eve per cent of our cases. The whole emption may be hemorrhagic, or it may be so only upon certain parts-usually the ablomen or extremities. In such ricounstances small petechial spots take the place of the murules-the "black measies" of the older writers. It is in most cases a bad, but by no means a fatal symptom. We have seen it in several cases that were not especially severe. (3) The rash may be very faint, and of short duration, being scarcely elevated at all. (a) It may consist of very minute papules, closely resembling the rash of scarlet fever. It is to be remembered, however, that the irregular eruptions of scarlet lever much more frequently resemble measles than rice seven. (5) It may be very scanty, and late in its appearance; particularly in cases of great severity and hyperpyrexis—the se-called malignant cases. (6) Temporary recession of the cruption may occur at any time during the height of the disease. and is usually due to heart failure. A recurrence of the eruption after it has run its usual course is something which we have never soun; although such cases have been reported, they must be regarded as very exceptional.

During the first two days of the cruption, the local and constitutional symptoms increase in severity, both usually reaching their maximum at the time of the full development of the rash upon the face. The skin is swellen, and the seat of intense itching and burning. The spes are very red and sensitive to light, and there is swelling of the conjunctive with an abundant production of mucus or muco-pus, rausing the lids to adhere. There is pain on swallowing, also swelling of the glands at the angle of the jaw or in the postcorocal region. The cough is frequent and very amounts. There is complete anorexia, and often diarrhea. The tongue is coated, and may show at its margin cularged pupillar, somewhat resembling the "strawberry" appearance of scarlet fewer. As the rash fades the temperature declines rapidly, often reaching the normal in two or three days. The catarrhal symptoms now subside, and seen the patient is convalencent. Within a day or two after the fewer bus ceased, the rash disappears.

Desgureation.—This begins almost as soon as the rash has subsided, and is first noticed on the face and neck, where the cruption first appeared. The nature of the desquamation is invariably fine, bramay scales, never in large patches, as in scarlet fever. It is often quite indistinct and may be overlooked. Its usual duration is from five to

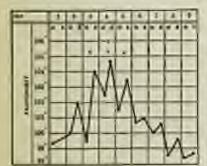
ten days. It may, however, he prolonged for two weeks. The amount of besquarantied varies considerably in the different cases. It is most marked in those in which there has been an intense eruption. There is frequently noticed at this time an ofor about the patient which is quite characteristic of measles. During this stage the cough often persists and the eyes remain weakand very sensitive to light, but in other respects the patient usually feels perfectly well.

 The Mild Cores.—The mildest cases are distinguished by low temperature, which at the height of the erap-



Fro. 158.—Trevenantine Cours to Unconstruction Measure, Successive the Grape to Emplaye Lower can Fair. Patient ten years old; X = first emption; X = full emption on the face.

tion usually reaches 100° or 100° F., but rarely lasts more than four days. The eruption is often scanty, and is never confluent. The swelling, itching, and other cutaneous symptoms are wanting, as is also the atense red color of the skin. The rash is frequently obscure, and, with-



For, 150.—Printed Charm in Unconrestation Minames, with Granula. Rose and Granula, Fall. Patient three years old.

out the other symptoms, hardly sufficient for diagnosis. The estarthal symptoms are more uniform than the rash, but these are very mild as compared with the usual form. The duration of the rash is shorter, desquamation is scarcely perceptible, and there are no complications.

 The Cases of Moderate Severity,—The course of measles is much more regular in children over three years old than in infancy. In the former, the symptoms of invasion come on gradually, and the tempera-

ture rises steadily until the appearance of the cruption, which is in most cases on the third or fourth day of the disease. Figs. 158 and 159 represent the typical temperature curve in average uncomplicated cases. Such a curve was seen in 44 per cent of 173 cases in which careful

observations were made. Sometimes the decline in the fever is very rapid, almost a crisis, as in Fig. 158, but more often it falls gradually, as in Fig. 159. In such cases the duration of the fever is from five to nine days, the average being about a week. The other symptoms follow tery aboutly the course of the fever. The maximum temperature is nearly always coincident with the full rash upon the face, at this time

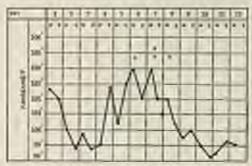


Fig. 180.—A. Nor. Investment Temperatures Course in Manager, Survivo Abstract Invances, new Sunnegator Count Terman. Uncomplicated case: patient nine months old.

usually being in monophicated cases from 163° to 164° F. in older children, and 164° to 163° F. in infants and young children.

A not very uncommon bemperature curve is that of Fig. 100, where the onset of the disease is marked by a sudden rise to 102° or even 104° F., with a fall nearly or quite to normal on the second day, after which the fever rises gradually, as in

the first group. This curve was seen in five per cent of our cases.

3. The Severe Cuses.—In Fig. 161 is shown a type of the disease which is more frequent in infants than in older children, the important features being the late eruption and the continuance of the high fever for several days after the rash has begun to fade. Such a prolonged



Fro. 163 - Minimum with Progression Decayton. Communities of high temperature after full sruption due to severe broadchins and distribut; child two years self.

course and so high a temperature are almost invariably due to muce complication, usually broachopneumonia. When the pursuancia genou to the production of areas of consolidation, the force isually continues for three and sometimes for four weeks, even though terminating in prootery. Figs. 162 and 163 illustrate two types of the disease which are often seen when meades is complicated by pneumenia. In cases like that

shown in Fig. 165 the quest is abrupt with high temperature, prestration; and pulmonary symptoms not unlike those of primary pasumonia. A temperature curve resembling this was som in 38 of 173 cases. The rash is often late in appearance; it is faint and altogether irregular; it may recede after the first day and reappear after an interval of one te two days. The returnal symptoms are not marked, but the whole leers of the disease nems to be expended upon the

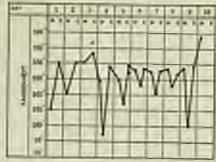


Fig. 342—Ferric Arriver or Massas, Confedence by Recommencements, Terr seven symptoms from the onest; patient eightons months (sk); sinth on tenth day.

lungs. The diagnosis of these cases presents great difficulties, and very often it would not be made but for the fact that there are other cases of measles in the family or the institution. This form is usually seen in

infants, and it is nenally fatal.

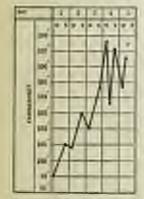


Fig. 162.—Paran Arruck or Ministee Convincerate or Betochtoroxicmona. Early invested mid, but apid development of severe symptoms on fourth day; rask or last skey; patient sight months old.

In other cases marked by a sudden secure omet, the system seems to be overpowered by the poison of the disease itself. There is profound depression, and hyperpyrexia, and the patient may die from tozomia with cerebral symptoms before the appearance of the rash or just as it is beginning to show itself. Sometimes the palmonary symptoms are entirely wanting; at others the rash, if it appears, is hemorrhagic.

In still mother group of cases the onset is not violent, and for the first two days the attack may appear to be of only average overity; but there may then develop, often quite suddenly, pulmonary symptoms of such intensity as to cause death within twenty-four hours. The eruption, if seen at all, is faint and not obseracteristic (Fig. 163).

A secondary rise in the temperature after it has once fallen to normal was seen in 8 of 173 cases, being due to the development of stitle, ileocalitie, or presuments.

Complications and Sequelae. The most frequent and most important

complication of measles is branchoparamenia, and next to this are ileacolitis, obitis, and membranous laryngitis. Most of the others are infrequent; all complications are relatively infrequent in children over four years old.

Lange.—The greatest danger in measles arises from pulmonary complications, and the frequency is greatest in children under two years of age. In two institution epidemics, embracing about 100 cases, nearly all in children under three years old, bronchopnenmonia occurred in about 40 per cent of the cases. Of these who had parametria, 50 per cent died. Fortunately, such a record as this is never seen outside of institutions for young children. Of 2,477 cases, embracing several epidemics of measles among children of all ages, presumonia occurred in 10 per cent. Our sum experience in the post-mortem room fully bears out the statement of Henoch, that a certain amount of presumonia is found in almost every fatal case. Procumenia is more frequent and its mortality is higher in spring and winter epidemics than in those occurring at other seasons. It may decade a tary time from the beginning of invasion until convalencence, but it must frequently begins about the time of full cruption.

Lohar pasamonia, although rare, occasionally occurs as a complication in children over three years old. In some epidemics many of the cases of paramonia are complicated by avere picarisy, which adds much to the danger from the disease. This form is frequently followed by empyersa. Pasamonia is always to be suspected when the temperature continues high after the full appearance of the rash.

Broachitis of the large tubes, always accompanied by tracheitis, is seen in every case of measles, possibly excepting a few of the very mildest. This is so constant a feature as hardly to be ranked as a complication. In nearly all of the arrero cases the broachitis extends to the medium-sized and smaller tubes.

Laryer.—A mild catarrhal laryegitis accompanies almost every case of neutles. Senere catarrhal laryegitis is present in about ten per cent of the cases; it may give symptoms which closely resemble those of membranous laryegitis, and the two are no doubt often confused.

Membranous largingitis is especially seen in the epidemies of institutions. As a cause of death in older children it ranks next to premmonia. When it develops at the height of the disease, it is sometimes due to the streptococcus; but when it develops at a later period, it is usually due to the diphtheria bucillus. The streptococcus inflammation is in most cases associated with similar changes in the pharyax or tomila, but not always. True diphtheria, occurring as a complication of measles, not infrequently begins in the largus. The streptococcus inflammation may be as serious in this connection as is true diphtheria. from the probability, which amounts almost to a certainty, of the development of broachopsermonia. No complication is more to be dreaded than this. The diagnosis between the two forms may sometimes be made by the time of development, but only with certainty by cultures. We once saw in measles, where no false membrane was present in the rest of the largux, a necretic inflammation with almost entire destruction of the vocal cords—a condition which may be compared to that seen in the tensils or epiglottis in scarlatina.

Threat.—A catarrial angina is part of the disease, and is as characteristic of measles as is the symption upon the skin. There is acute congestion and swelling of the tonsils, uvola, paints, and planyns. In a certain preportion of cases, very much less frequently than in scarlatina, the development of membraneus patches is seen upon the tonsils and adjacent mucous membranes. These occur in two or three per cent of the cases. They are to be regarded in the same light as similar conditions complicating scarlet fever, with this difference, that in measles there is much greater likelihood of the extension of the disease to the largus, while extension to the nose and cars is much less probable. True diphtheria, however, may complicate measles, and cases of membraneus inflammation of the tonsils or pharynx developing late in measles are mostly due to the Klebs-Loeffer bacillus.

Although in most cases the inflammations of the pharyax and tonsils which accompany measles are not serious when they are due to the streptococcus, they are sometimes quite as severe as any that accompany scarlet fever. They may cause death from general sepsis apart from any affection of the laryax.

Digestive System.—Gastrie disorders are not more sommon than in other febrile diseases; but diarrhen is very frequent, and in summer it may be even more serious than the pulmonary complications. All forms of diarrhen are seen, from that which results from simple indigestion to the severe types of ilevalitis. This complication is most often seen in children under two years old. The most severe intestinal symptoms are not usually seen at the height of the primary fever; but, beginning at this time, they often increase in severity, and are most marked in the second and third works of the disease.

Catarrhal stomatitis is present in almost every case of measles; less frequently the herpetic form is seen. Ulcerative stomatitis is not uncommon, particularly in institutions. One of the worst complications of measles, but fortunately a rare one, is gaugemous stomatitis, or norm. This usually securs in immates of institutions, or in children with bad surroundings who were previously in wretched condition. It is nearly always fatal.

Gangrerous inflammations of other parts of the body are some-

times seen after measles, especially of the ear, the vulta, or the prepare

Necessar System.—Convalsions are seldom seen at the cause of measles. During the progress of the disease they are not so rare, and may essur in connection with editis, meningitis, or secure beauthopneumonia—chiefly in infants.

Meningitis is rare, but either the simple or the tuberculous form may occur, more often, however, as a sequel than as a complication. Mental disturbance, usually of a temporary character, occasionally follows messles. In the epidemic of 108 cases reported by Smith and Dahney, insanity was noted three times, all the cases terminating in recovery, Epidepsy and chorea are rare sequelas.

Erra.—Otitis is a frequent complication in some epidemics; in others it is coldem seen. In one hospital epidemic it was noted in 14 per cent of the cases. This epidemic occurred in early spring and affected very young children, both of which circumstances are favorable for the development of citis. Usually both care are affected, but the otitis of measles is, as a rule, less senous than that of scariet ferce.

Eyes.—Simple catarrhal conjunctivitis accompanies nearly every case of measles. In the severe form there is a mucopuralent catarrh, which may attain any degree of severity. In neglected cases, and among children who are poorly nourished, especially in asylume, the disease is upt to extend to the corner. Chronic conjunctivitie often persists after measles, particularly in the class of children just mentioned.

Lymph Nodes.—Swelling of the lymphatic glands of the neck is frequent, but not generally severe, and rarely terminates in suppuration. Chronic enlargement may continue for months, and sometimes the glands may become tuberculous. Similar changes and similar consequences may occur in the glands of the tracheobrouchial group.

Kidneys.—The infrequency of renal complications in measles is in striking contrast to scarlet fever. Transient febrile alluminums is not uncommon, but a serious degree of nephritis, either clinically or at autopsy, we have never seen, and literature furnishes but few cases.

Heart.—Both endocarditis and pericarditis have occurred in the course of measles, but they belong to the rare complications. The same may be said of changes in the muscular walls of the heart.

Stin.—As complications, erosipelas, furnienlesis, impetigo, and pemphigus have been noted; but all are rare.

Hemorrhages.—Associated with the hemorrhagic type of the cruption, severe and even fatal hemorrhages may secur from the muonimembranes, and the latter are sometimes seen without the hemorrhagic eruption.

Elect.—In cases which have been studied early in the stage of incubation a lymphocytic lensocytosis has been observed. Thus is encooded by a tencepenia in which there is a reduction in the lymphocytes both actual and relative. This condition is marked one or two days before the cruption—sometimes even earlier—and continues during the height of the disease. A decided leucocytosis during this time or later points to a complication.

Other Infectious Diseases:—Measles in institutions is often complicated by diphtherm. Searlet fever or varicella occasionally occurs during nessles, though it is rare that the two scruptions are exactly simultaneous. Epidemics of measles and whosping-cough frequently occur tagether or follow each other. The relation of measles to tuberculosis seems to be particularly close. In some cases general or pulmonary tuberculosis follows directly in the wake of measles, which seems to furnish, especially in the lungs, conditions which are favorable for the development of latent tuberculoses. As a late manufactation the most common one is tuberculosis of the bones, occurring as hip-joint disease, caries of the spine, etc. An attack of measles in a child with latent tuberculous antecedents should, therefore, always be looked upon with apprabenism.

Diagnosis.- A sign of the greatest diagnostic value is the buscal emption. Although it appears that this was described many years ago he Pliadt, of Donmark, it is to Keplik that the credit belongs for its independent discovery and for the appreciation of its diagnostic significance. The unit of the cruption is a blaish-white speck upon a red ground; only a few of these are present for the first twenty-four or thirty-six hours; after this the musous membrane may be fairly peppered with them. Often they are not seen except by careful search, for which strong simlight is necessary; artificial light is not satisfactory. The spots are best seen on the inside of the cheeks opposite the molar teell, and in most cases only there; but they may be present on almost any part of the buccal muccus membrans. Their diagnostic value is his to the fact that they are nearly always present, that they are not found in other diseases, and that they neally appear two or three days. before the skin cruption. This generally disappears at the time of full emption.

We have records of an epidemic of 187 cases in an institution in which careful notes were made regarding this buccal eruption: it was sumistakably present in 169 cases, absent in 8, doubtful in 10. In 28 cases, fever, rash, and Koplik's sign were all present at the first obsertation. In 34 patients the sign was noted one day before the rash; in 28, two days before; in 1, three days before; in 3, four days before; and in 2, dwe days before. In 3 the spots were not seen until after the skin cruption; in one case they were present without any cruption. As this patient had been exposed and had a prolonged fever, it seems fair to regard the case as one of measies. In only one case was the buccal coupling seen before any elevation of temperature.

These facts, amply confirmed by other observations, indicate that Koplik's sign is of value in enabling us to make a diagnosis from one to three days before it is possible by the skin emption, also in furnishing a means of distinguishing measles from the other emptire fevers, as well as from rashes due to drugs, antitoxin, etc.

Other important symptoms are the corpus, the gradual rise in temperature, and the eruption which appears first upon the neck and face, and slowly extends over the body. Cases which present the greatest difficulties in diagnosis are usually the very severe ones and those in infants.

Prognosis.—This depends upon the age and previous condition of the patient, the character of the epidemic, and the sesson of the year. Except in children under three years of age, the deaths from measles are few; but in institutions containing young children, no epidemic disease is so latal.

The general mortality of the disease is from 4 to 6 per cent; but in epidemics in institutions for young children it has, in our experience, ranged from 15 to 35 per cent. The following table gives the figures of an epidemic in one institution:

From	six to twelve awarths	42	eskei)	mortality,	33	per	cent.
*	time to the second	51	400		50	*	*
	two to three years	27			30	-	*
	three to four years.	20	A.	1.8	14		
*	four to live years	3			0	18	

In any single case the important symptoms for prognosis are the temperature and the character of the eruption. An initial temperature above 103° E, or one which remains high until the eruption appears, is a last symptom. So also is one which rises after a full cruption, or which does not fall as the rask foles. The following table shows the highest temperature and mortality in 161 hospital cases:

Highest	temperature	mri. never 102° F.	6 years	et mortality,	0.	(er	cent
		102" to 103.5" F.	14 "		4	*	
- 40	-	104" " 104.5" F.	49 *	100	16		
		1057 * 105.5°F.	85 *		40	1.0	
	-	100° F. or user.	27 4		30		4

A favorable eruption is one of a bright color, covering the nody, remaining discrete, and spreading gradually. It is unfavorable for the eruption to appear late, to be very faint, scanty, or homorrhagic, or to recode suddenly, as this is usually due to a weak heart.

Of 51 fatal cases, the cause of death was bronchopneumonia in 43, ifeocolidis in 4, and membranesis laryugitis in 2. More than half the

deaths occurred during the second week, the earliest being upon the fifth day of the disease.

The ultimate result of an attack of measles may not be evident for some time. Cases in which the temperature persists for two or three weeks without assignable cause after the disease is apparently over, should be watched with the greatest solicitude. The explanation of this is most frequently to be found in the lungs, although the physical signs are often abscure. The condition may be either presuments or polymonary tuberculosis. Even though the attack of measles may not have been in itself severe, seeds are often sown the full fruits of which are not seen until long afterward. Chronic glandular enlargements which may or may not be tuberculous, chronic bronchitis, chronic larragitis, subscute or shronic nasal catarris, hypertrophy of the tonsils, and adented growths of the pharyax—all are frequent sequeles.

Prophylaxis.—Mensles is often regarded by the laity as so mild a disease that its prevention is thought to be of little importance, and no effort is made to limit its extension. The great probability that every person at some time in his life will have the disease, is no justification of nanecessary exposure. Although in older children measles is usually mild, this is not so in infants, who should be carefully protected from exposure. Special care should also be taken to avoid the exposure of definite children or those with a strong tendency to pulmonary disease or to tuberculosis. In institutions it is of the atmost importance to secure prompt and complete isolation of the first case which appears

The disease being nearly always spread by the patient, it follows that while early isolation is more important, there is not required the same thorough disinfection of apartments which should follow every two of sourlet fever. In an institution, the ward or cottage from which a case has been removed should be quarantized for at least sixteen days after the appearance of the last case, and absolute security can not be said to exist until the end of three weeks. The same rule should be applied in private families where children who have been exposed should be quarantized apart from the patient, but not sent away. In ordinary circumstances the quarantize of a case of measles should be placed at two and a half weeks, or ten days from the beginning of the cruption. It should be continued longer if there is critic, or a most discharge.

Theoretic cleaning and distinfection of the sick-room should be done before it is again occupied by children, and it should remain vacant at least two weeks. Children should be kept from all schools while the disease is in their homes, chiefly because they are otherwise liable to spread the disease while suffering from the early symptoms of invasion.

Treatment.-Member is a solf-limited disease, and there are no known

measures by which it can be aborted, its course shortened, or its severity bracehol. The indications are therefore to treat serious symptoms as they arise, and, as far as possible, to prevent complications, which are the principal cause of death.

While the hed should be acreened to protect the ameitive eyes of the patient it is not desirable to exclude sunlight from the sick-room. Every child with measles should be put to bed and kept there with light corering during the entire febrile period. There can be no possible advantage in causing a child to swelter by thick covering, under the delinion that the disease may be medified thereby. The food should be light, find, and given at regular intervals. If the conjunctivitie is severe, and cloths should be applied to the eyes, which should be kept dean by the frequent use of a solution of boric acid, the lide being prevented from adhering by the application of vascline or some simple ointment. The intense itching and lurning of the skin may be relieved by immetions of plain or carbolized vaseline, or by bathing with a solution of bicarbonate of sods. The cough, when distressing, may be allayed by small does of cooms, either in the form of codein or the brown mitture. The restlement, headache, and the general discomfort which accompany the height of the fever may be relieved by an occasional desc of phenacetin. As soon as the rash has subsided, a daily warm both should be given, followed by inspections to facilitate desquamation,

The important indications to be met in the severe cases are very high temperature, cardiac depression, and nervous symptoms—duliess, stopor, sensitines come, or conventions. In some of the cases there is in addition dysprea and examosis, showing severe nearly pulmonary congestion. For the nervous symptoms and high temperature, nothing is so reliable as the cold both or puck and the nearly continuous use of ise to the head. We do not think there is any evidence that the use of cold increases the liability to pneamonia; but cold extremities, feelile pulse, and cyanosis, when associated with high temperature, call for the last mustard both, although ice should still be applied to the head. The indications for stimulants and the methods of using them are the same as in broachopneumonia, which is usually present in cases requiring them.

To diminish the chances of pneumonia, it is necessary that every patient should be kept in hed during the attack, and care exercised to avoid exposure. But still more important is it in hospitals and institutions where most of the cases of purmionia occur, to allow the patients plenty of air space, never exceeding them together in small wards. If possible, cases complicated by pneumonia should be separated from simple cases. The pneumococcus and the streptococcus are found in the month in such numbers that systematic disinfection of the month may grave of some value. The danger of diphtheria as a complication may be greatly lessened if during epidemics of measles in institutions every rass receives an immunizing dose of diphtheria antitroxin.

The broughitis and broughopneomenia of measles should be managed as when they occur as primary discuses, since the coexistence of measles furnishes no new indications. The same is true of the diarrhea, conjunctivitis, stitis, membranous laryngitis, pharyngitis, and too sillitis. Should cultures show the presence of the dipatheria bacillus, the case abould be treated like one of dipatheria.

During curvalescence the eyes should be used very carefully for at least several weeks. Should the cough and slight fever persist, with an without physical signs in the chest, the patient should, if possible, be sent away to a warm, dry, elevated district, as the development of luberculous is always to be feared. Coddiver oil should be given our tinusually throughout the succeeding cool season, and iron and other terrics according to indications. The cough itself should be treated as when it follows an ordinary broughitts, creomite being more generally useful than any other drug.

CHAPTER III

RUBELLA

(German Measles; Rötheln)

Represal is a contagious oraptive fover which is rarely seen except when prevailing epidemically. It is characterized by a short invasion, with mild, indefinite symptoms, usually lasting but a few bours, and by an eruption which is generally well tracked hid of turishle appearance. The constitutional symptoms are very mild, and the disease rarely proves faint, not often being even serious. For a long time rubella was conformed with measles and scarlet fever, as the cruption sometimes resemtles one and sometimes the other disease. Its identity is now fully established, and, as Strömpell well says, its existence is doubted only by those who have never seen it.

Rubella is not a simple affection of the skin; it prevails independently either of measles or of scarlet fever; its incubation, eruption, invasion, and symptoms differ materially from those of both these diseases; it attacks indiscriminately and with equal security those who have bud incuses and scarlet fever and those who have not, nor does it protect in any degree against either of them; it never produces anything but rabella in those exposed to its contagion; it occurs but once in the same individual.

Etiology.—Rabella is beyond question contagious, but is decidedly loss so than either measles or earliet fever; so that some observers inve doubted its contagion altogether. It can be communicated at any time during its course, but is especially contagious during the early stage. Epidemics neually prevail in the winter or spring. As in the other cruptive fevers, a striking immunity is seen in infants under six months old; but, with this exception, all ages are liable to the disease.

The incubation of rubella varies considerably; the usual period is from fourteen to twenty-one days, although the limits are from ten to

twenty-two days.

Symptoms.—Incomes.—This is rarely more than half a day, and in many cases no predremata whatever are noticed, the rash being the first thing to attract attention. In a few cases there are mild catarrhal symptoms, with general malaise and slight fever. At other times there may be vomiting, convulsions, delirium, epistaxis, rigors, headache, or diminess; but all are to be regarded as very exceptional.

Eraption.—Frequently a child makes in the morning covered with the rash, no symptoms having been previously noticed. It generally appears first upon the face, and spreads rapidly to the whole body, the lower extremities being last covered. Less than a day is usually required for its full development. Exceptionally the eraption comes first upon the chest and back, and sometimes nearly the whole body is covered almost at once. The rash is occasionally observed in the roof of the month before it is visible on the face. In a considerable number of cases the entire lody is not covered; but the rash is more constantly seen upon the face than upon any other part of the body.

Its character is subject to considerable variation. The emption is most frequently composed of very small maculopapules; they are of a pale-red color, and rary in size from a pin's head to a pea. The spots are usually discrete, but may cover the greater part of the body. On the face it is frequently confinent, and often appears here as large, irregular blotches of a red color. From this description the rash will be seen to resemble that of measles more than that of any other disease. Very often, however, there is a fairly uniform red blush which bears a close resemblance to the rash of scarlet fever; but even in such cases there will nearly always be found upon some part of the body, asmily the wrists, fingers, or forehead, some typical maculopapules. Between these two extremes all variations are even. The color of the armytion is sometimes dark red, and rarely it has been noted to be hemorrhagic. The degree of alevation above the surface is also variable; sometimes this is so marked as to give to the skin a "abotty" feel, while in others the

elevation is scarcely perceptible. The duration of the eruption is usually three days. Occasionally it lasts only two days, and it may last but one; it is rure for it to remain as long as four days. It fades in the order of its appearance, and more rapidly than the eruption of measles. A slight brown pigmentation of the skin sometimes remains for a few days after the rash.

The highest temperature is coincident with the full eraption; this does not nearly exceed 101°, and often it is only 160° F. As a role, the temperature continues but two days, falling as the eraption fades. Very eften the fall to normal is abrupt. Harely more severe cases are seen in which the fever lasts for two or three days, being 101° or 102° F, thring the invasion, and rising to 103° F, or more during the fall eraption. The other symptoms are in most cases even less marked than the fever. Occasionally extarrhal symptoms resembling a mild attack of measles are present, or a sore throat suggesting mild scarlet fever; but more frequently all these symptoms are absent. The cruption is usually out of all proportion to the other signs of discusse.

Swelling of the post-cervical glands is one of the most constant features of rubells. In most spolemics it is seen in nearly all cases; but as a symptom for differential diagnosis it is not of great importance, as it is not uncommon in measles and searlet fover. The glandular swelling is most marked at the height of the disease; it is never very great, and subsides slowly without suppuration. Vomiting and diarrhea are rare. Swelling and itching of the skin are usually present and sometimes marked. There is no lencocytosis in this disease.

Furchheimer has described an eruption on the mucous membrane of the throat, or "smanthem," which he believes to be characteristic. It consists of minute, bright, rosy-red points, seen on the avala and soft palate, rarely on the hard palate. It is present only during the first twenty-four hours.

Despuresation.—This is exceedingly variable. It is sometimes entirely wanting; writers who have observed some fairly typical epidemics have stated that it did not occur. In most cases, however, some desquarantion is precent, though it may be so slight as to be discovered only by a close examination. It is usually in the form of the scales over the body and extremities. In a few cases it is more pronounced, and may be in larger flakes or patches.

Prognesis.—There are few discuses so free from danger as rubella. Complications and sequelae are very seldom seen, and when present are usually of the mildest character.

Diagnosis.—The principal interest attaching to rabella is in its diagnosis. This is a matter of extreme difficulty, and often it is an impossibility. The characteristic thing about the disease is a well-marked erup-

tion with very few other symptoms. Cases so closely resemble mild scarlet fever that the differentiation by symptoms may be impossible; it must be made by the circumstances in which the disease occurs, especially a prevailing epidemic. Scarlet fever with a low temperature and abundant rash should always be regarded with suspicion; also an abundant rash with little or no desquamation. The longer period of incubation in rubella is often of much assistance. Koplik's sign furnishes a valuable means of distinguishing measles from rubella. The difficulties in diagnosis can be appreciated only by one who has seen epidemics at measles and scarlet fever in institutions, and has watched the exceedingly mild course of undoubted cases of these diseases which have there occurred.

It is always hazardous to make the diagnosis of rubella unless the disease is pretailing epotemically. Sponsite cases in which this diagnosis is made are, we believe, almost invariably instances of mild meads or scarlet lover. The first cases of rubella in an epideseccure usually overtooked. The continued absence in succeeding cases of the characteristic symptoms and complications of meads or search forcer should suggest to the physician that he is probably dealing with rubella.

Treatment.—None whatever is required for the disease excepting so-lation, which should be complete until the diagnosis is positively determined; after this it is hardly necessary. The individual symptoms and complications are to be treated as they arise.

CHAPTER IV

VARICEALA

(Chicken-pas)

Varietiza is an acute, contagious disease, characterized by a extaneous eruption of papules and vesicles and by mild constitutional symptoms, serious complications and sequelar being very rare. Although long confounded with varioloid, its existence as a distinct disease has been generally admitted for many years.

Etiology.—It is well retablished that the contogium of the disease is contained in the vesteles, as it may be communicated by inoculation with their contents. The specific power, however, has not yet been soluted. Varieslla is contracted by exposure to another case or through the medium of a third person. It affects children of all ages, one attack being as a rule protective. It is very contagious, resembling menules in this respect. The period of inculation is quite uniformly from fourteen to exteen days.

Symptoms. Sight fever and general indisposition may be noticed for twenty-four hours before the appearance of the eraption, but in most cases the eruption is the first symptom. It woulds appears first upon the face or trunk, as small, red, widely scattered papules. The napules in most cases come in crops, new once continuing to appear for three or four days, even upon the same part of the body. The earlier ones have generally begun to dry up by the time the later ones appear, so that all stages of the cruption may be present at one time in the same region, this being our of the diagnostic features. The papules are at first very small, but gradually increase in size, and are surrounded by an arcola from sus-fourth to half an inch in width. Many of them go no further than this stage, but the majority become vericular. The vericles are usually flat, and vary a good deal in sore-the largest being about one-fourth of an inch in diameter. The process of drying up generally begins at the outer; this causes a slight depression, giving the reside a somewhat umbilicated appearance. The arcola is most distinct at the time of the fally formed reside, and fades as the latter sines. Crusts now form, which fall off in from five to twenty days, depending upon the depth to which the skin has been involved. In the majority of cases no mark is left, but after the most severe attacks, when the true skin has been invelved, sears remain, and occasionally there is quite deep pitting. Such marks are few in number, and are most likely to occur upon the face.

Semetimes, aspecially upon hands and feet, the vesicle appears without having been preceded by a pupule; eften there is no ariola, and the vesicle resembles a drop of water upon healthy skin. In most cases pustules are not seen, but they may develop in consequence of irritation or infection, the result of scratching, or in children who are poorly near-shed. Under these circumstances deeper alteration may occur, lasting for weeks. In rare cases there may be a necessite inflammation about the site of the pock, a condition to which is sometimes given the name curi-cells gaugieross. It is not pevuliar to varicella, and is described elsewhere under the bend of Gaugierous Dermatitis.

The pecks are nearly most alumbant over the back and shoulders. In mild cases only twenty or thirty may be found upon the entire body, but in severe cases the skin in certain regions may be nearly covered. The emption is never confuent. The pocks are usually seen on the hairy scalp, and often on the mocous membrane of the mouth or pharyax—a point of some diagnostic value. In the latter situation the appearance is first as a tiny cestele, and later as a superficial after resembling that of herpetic stomatitis. Marfan and Halle have described cases of wricella of the largue. Croupy symptoms were present, and in one

case which proved futal from payaments a tiny tiker was found on the usual cords.

The temperature is highest when the cruption is most rapidly appearing, this usually being the second or third day. In an average case it reaches only 101° or 102° F., and lasts but two days; in severe cases it may rise to 104° or 100° F., and lasts for four or five days. It falls gradually to normal as the rash fades. The other symptoms are mild and not characteristic.

Complications.—The most important complication is erysipelas, which develops about the poeks, particularly when they are deep and attended with some absention. We have known of several Istal cases from this cause. Adentis, either simple or suppurative, and absences in the collular tisone, are recorded. It may occur at the height of the discuss, but more often at a later period, like the neghritis of scatlet feser. Variedla is quite frequently complicated by other infections discuss. We have seen coincident scarlet fever in a number of cases. Severe nervous lexions occasionally follow variedla, the most frequent being encephalitis. We have seen transverse myelitis develop in a boy of seven after an attack of variedla.

Diagnosis.—The diagnosis of varicella is usually easy, provided the following points are kept in mind: first, that the cruption comes sat slowly and in crops, so that papules, vesicles, and crusts may be seen upon the skin in close proximity; secondly, that the untilication is due only to the made of drying up of the vesicle, which begins at the center; thirdly, the appearance of the pocks upon the mucuus membranes, and the bistory of exposure. It is distinguished from urticaria and other forms of skin disease by the presence of fever and often by the lesions in the mouth. Cutanceus inocalations from fresh vesicles, as first practiced by Kling, apparently protect against varicella. At the site of inocalation small localized lesions are produced, but there are no general symptoms.

Treatment.—Although it is usually a trivial discose, isolation of cases of varicella should be enforced in schools and in institutions containing many infants. In the home, unless other children are delicate or in pose condition, quarantine is unnecessary. The discuss may probably be conveyed as long as the crusts are present, home isolation should be maintained until they have fallen off. In most cases constitutional symptoms of the discuss are so mild as to require no treatment.

Locally, the ifching, whom anneying, may be allayed by sponging with a solution of bicarbonate of sola, a ope-personal solution of carbolic acid or the use of carbolized usedine. When the cruets have formed, this similarit or caseline containing two per cent ichthyol should be applied. Care is necessary to keep the skin clean, and, in the case of infants, to present scratching. In severe cases the urine should invariably be examined.

CHAPTER V

VACCINIA-VACCINATION

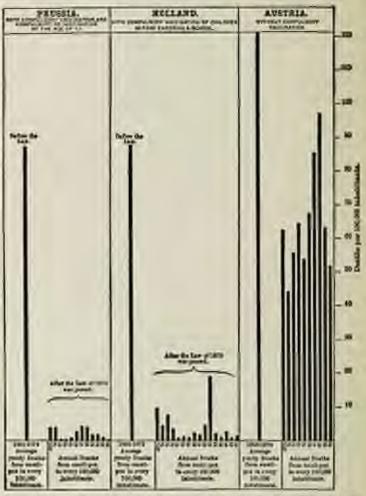
Vaccinia (cowpox) is a febrile disease induced in man by inoculation with the virus obtained either directly from the rew (bovine virus) or from a person who has been ineculated (humanized virus). The discase is not contagious in the ordinary sense of the term, but is communicated by ineculation either accidental or intentional.

The protection against analipses which traceinston affords is one of the lest attented facts in medicine. Its effect when systematically practiced is graphically shown in the accompanying chart (Fig. 164). It is the imperative duty of the physician to see to it that every young infant is vaccinated.

Revaccination —Regarding the duration of the protestive power of a single vaccination, positive statements are impossible. Nearly all writers are agreed that vaccination should be done in infancy, again at paterty, and a third time at about the age of twenty or twenty-five. Many also insist upon re-vaccination at about the severath year. It is a safe rule when smallpox is prevalent to vaccinate every person who has not been successfully vaccinated within five years.

Chaice of Lymph.-The substitution of bovine for humanized virus is now well-nigh universal. It has preduded the possibility of transmitting syphilis and greatly lessened the chances of other forms of infection. A still further advance was made by the introduction of "governated" lymph. As now prepared, the lymph is taken from the called under the most rigid negatic productions and smulsified with glyceria. The few saprophytic factoria present usen die, so that when properly prepared the glycerinated virus is practically sterile. It should not be distributed until it has been carefully tested for pathogenic organions of all kinds, particularly the tetanus busillus. It is preserved and distributed in capillary tubes becautically scaled; these are much cafer than quills or ivery points, which may easily become contaminated by hardling. After the lymph has been taken, the calves are killed in order to make certain that they were free from disease. The practical advantages of gipcerinated lymph are so great that it has been efficially adopted by the Governments of the United States, Great Britain, Germany, and many other countries.

Neguchi has succeeded in cultivating vaccine virus in vitro. It can readily be produced in indefinite quantities; so that we may seen hope to be supplied with virus in pure culture, free from all possibility of barterial contamination from animal sources. Experience with its use indicates that it is quite as effective as the ordinary bovine virus.



PRO 104.—Table Survivo the Parencers Power of Vaccination, (Commit)

Time for Vaccinating.—In selecting a time for vaccination, the child's age and general health must be taken into consideration. It is pertry well established that the constitutional disturbance is much less in infancy than in later childhood; and there is buildes in infancy less chance of accidental infection of the vaccine wound. Between the ages of two and six months seems the best general time for raccination. In delicate infants or in those whose nutrition is a matter of great difficulty, those who are syphilitic, those suffering from comm or any other form of active skin disease, vaccination should be deferred until the child is in good condition, unless he is likely to be exposed to smallpox.

Methods of Vaccinating.—In our experience it is preferable to vaccinate in a single place rather than to make two or three inoculations. Rither the leg or the arm may be chosen; in young infants it is usually easier to protect the vaccine sore upon the leg than upon the arm; in childrer old enough to run about, the arm is to be preferred, as being more usually kept at rest. The point selected for inoculation should be either the outer aspect of the left culf, about the junction of the middle with the upper third of the leg, or, if the arm is chosen, the insertion of the left deltoid. Vaccination should be regarded as a minor surgical operation and the hands of the physician, as well as the arm of the putient, should be washed with soap and water, dried, and the skin then washed with alcohol.

The New York Health Department supplies with each take of lymph, a sterilized needle and a rubber bulb. A single scratch not more than sus-fourth of an inch long is made with the needle just deep enough to draw blood; or a minute scarification may be made not over one-eighth of an inch in diameter. The ends of the capillary tube are broken off, and the lymph blown out of the tube upon the scratched surface and rubbed in for a full minute. The wound should not be covered until dry; a sterilized bundage should then be applied. The limb should not be washed for twenty-four hours.

The Normal Course of Vaccinia,-The course of a proper vaccination-pock is quite uniform, and one which does not follow this course should not be considered protective. The wound heals and nothing is noticed until the third or fourth day, when a red papule makes its appearange. Usually in twenty-four hours more a small vesicle appears which enlarges until the sixth or seventh day, reaching its full development about the ninth day. Its shape and size depend somewhat upon the extent of the scarification (Figs. 165-169). The testicle is usually from one-fourth to one-half inch in diameter; it is of a pearly-gray color and has a depressed center. During the next two days an areola forms about the vesicle extending from it a variable distance, usually for one or two inches into the healthy skin. Its size depends upon the intensity of the infection. This areola is normally of a bright-red color and accompanied by some induration. It is generally at its beight about the ninth day. The vericle usually dries down to a firm, dark crust which remains from one to three weeks and falls off, leaving a bluish star which fades to white, becoming somewhat honey-combed. When the process is at ris



Fig. 163-Pills day.



Fre. 100. Sevenit day.



Pro. 167 .- Night day-



Fig. 168.—Divyoth day:



Tro. 103 -Teath day.

First, 165-199. "Vacctor Vacctor. (Two-thirds natural size.)
First, 165, 166, 167, and 169 show appearance of reside at the different stages when a very small scarcification is made.

Fig. 100 shows the effect of a larger availablation with a page inhone areals. The amount of inflamention is exceeded but not unusual.

beight some constitutional disturbance is usually present; there may be less of appetite, fretfulness, and general indisposition, and the temperature is usually elevated from one to three degrees. The lymph nodes in the groun or axilla may be tender and secollen. These symptoms generally last for three or four days.

If in a young infant the first inoculation is unsuccessful, at least three trials should be made with good virus, and in the event of further failure, after a year vaccination should be repeated. A failure to inoculate does not mean inconceptibility to smallpox, as is often popularly believed, but most frequently arises from the fact that the virus is inert. We have known one case in which the seventh, and another in which the

thirteenth, insculation was accessful after previous failures; oscustounly there are even children who can not be insculated at all.

Constitutional symptoms, as previously stated, may be absent in very psung infants; but in others there is quite constantly present a ferer which runs a fairly regular course. It usually begins on the fourth or fifth day, is remittent in type, and rises gradually, reaching its highest point with the full development of the



Fro. 170. - Communicate Voccasta, Boy eight

reside. At this time even without complications it may touch 104" or 105° F. The duration of the fover in cases running the usual course is four or five days. Accompanying the fever there may be ancrexia, restlessness, loss of sleep, slight indigestion, and other symptoms of a general indisposition.

Both the local and the general symptoms are sometimes more severe. This may depend upon the susceptibility of the child, even though the lymph is pure and the vaccination properly done. The original vesicle may be much larger than usual, and small secondary vesicles may form in the neighborhood. In very rare instances a generalized eruption of true vaccine vesicles occurs with fover and other general symptoms of corresponding severity (Fig. 170). Single vesicles may be produced on distant parts of the budy as a result of auto-inoculation, neually by scratching. When externs of the face is present, inoculation is not infrequently carried thither. Most of the very new arms and legs, however, are due

to infection from pyogenic bacteria accidentally introduced at the time of vaccination but more often subsequently. In the milder cases the swelling and other evidences of local inflammation are more marked than in a normal vaccination; a drop or two of pus forms beneath the crust, and when the latter comes away an excavation is left which beals in two se three weeks. Or, the inflammation may extend more deeply into the connective tissue, to be followed by more extensive suppuration or sloughing, leaving an ugly ulcer an inch or more in diameter which slowly fills by granulation in from five to eight weeks. Sometimes the period of incubation is unduly prolonged, so that the vesicle does not form untuthe twelfth or fourteenth day, although its subsequent course may be quite normal. In other cases the incubation is very much shorter than usual, and the vesicle may appear as early as the fourth or even the third day.

Much has been written about the so-called "enspherry excresemes" which not very infrequently takes the place of a proper voticle. It is of a dark-red color, elevated, amouth or alightly granular, not sensitive, having no areola and no constitutional symptoms. It generally persists for two or three weeks, and slowly disappears, leaving no sear. It is usually the result of virus of feeble activity, and if it gives any protection it is very slight. Such cases should always be re-vaccinated, and in our experience re-vaccination is usually successful.

Complications and Sequelae. Post-vaccine cruptions are many and of great variety. The next frequent is a general records, usually securring at the height of the local process. Other eruptions seen are untiearia, and, rarely, purpura. Complications are chiefly from accidental infection. Syphilis and tuberculosis are excluded by the modern method of procuring the lymph. Tetamus in sure instances has followed vaccination. It may result either from introduction of the becilli with the vaccine lymph but more often from subsequent accidental infection of the wound or sore. Cases of the first mentioned sariety are extremely rare. By proper legal restrictions regarding the production of succine virus they should be entirely eliminated. Its production should never be permitted in a district in which tetanns is endemic; and each quantity of lymph sent out should be tested for tetanus. In the great majority of the reported ones in which telimus has followed vaccination the eridence is strong that infection occurred subsequent to naccination, owing to want of proper care or insufficient protection of the vaccinated part. It should not be forgotten that vaccination produces an open wound, which may become infected like any other wound. The most common form of local infection is refluititis, which may terminate in suppuration or sloughing at the site of vaccination, and sometimes may cause supportation of the neighboring lymph nodes. Erysipelas may develop at any time before

the wound is entirely healed; it is usually due to neglect of proper precastions in the care of the vaccine sore.

The mertality of vaccination is stated by Voigt, from careful statistics drawn from German sources, to have been 35 in 2,375,000 cases, including both primary and secondary vaccinations. Of the deaths, 19 were due to erysipelas, 8 to gangrone, 2 to cellulitie, 3 to "blood poisoning," and 3 to other causes. Nearly all the deaths from vaccination are from causes which are preventable.

Treatment.—The whole purpose of treatment is to prevent infection. The first countials are a cleap limb, pure virus, and a sterile needle; the next, to allow thorough drying of the wound before the clothing touches 2. After this no treatment is necessary until the vesicle forms. Then the important thing is to prevent scratching and the irritation by the clothing. All succine shields are objectionable. For an infant nothing is better than the sterilized gauge handage, which can be kept in place by sewing to the stacking or to the alceve of the shirt. Any constriction of the limb is injurious. For older children the simplest dressing is a pad of sterile gazze fastened to the limb by two pieces of adhesive plaster. Should the visicle rupture and discharge scrum, it should be kept clean and dry by dusting daily with boric acid. When the local symptoms are at all arrere the limb should be kept at rest. An infected vaccination wound, like any other infected wound, requires careful surgical treatment; disastrous results often follow the use of poultiess and other applientisms much in vogue in domestic practice.

CHAPTER VI

PERTUSSIS

(Whooping-Cough)

Prerresses is a contagious disease which prevails epidemically and, in all large cities, endemically. Although it may affect persons of any age, it is generally seen in young children. While in later childhood pertussis may be ranked as one of the milder infectious diseases, in infancy it is one of the most fatal. Its principal complications are bounchopaeumonia and convulsions. Pertussis is characterized by extarrhal and nervous symptoms. The extarrh affects the mucous membrane of the respiratory tract, and is probably due to a specific form of infection. It is accompanied by a hyperesthetic condition of this mucous membrane. The most prominent nervous manifestation is a peculiar

spasmodic cough which occurs in paroxysms, and from which the disease takes its name. The rough is no doubt of reflex origin, from an irritation which has been located by different writers in various parts of the respiratory tract. In addition to these conditions, there is present in pertusois a marked irritability of the norvous system, which in infancy often shows itself by convulsions. Wheeping-cough is a disease whose importance is too often passed over lightly. In New York State it, causes more deuties than searlet fover and nearly as many as does typhoid fever.

Etiology.—Recent evidence points to the Bordet-Gengen bacillus as the specific organism of pertussis. It is a small Gram-negative bacillus which in many points resembles the influence bacillus. It is difficult to obtain the organism from the respiratory secretion unless the plug of mucus brought up after the paroxysm of coughing is secured, as it develops chiefly in the lower respiratory tract. It is found only in the early stage of the disease, rarely later than a week after the whosp begins. Smears are unreliable for diagnosis; only cultures are to be depended upon.

In nearly all cases the influence bacillus is present in the sputum, especially in the early stage. It may even be found before the Bordet bacillus, and may persist for weeks. Other organisms, particularly the pacamococcus and the streptococcus, are often shundant but appear in numbers later, after a week or two. In practically all cases there is mixed infection. The ctiological relationship of the Bordet bacillus to pertussus is supported by serological evidence. The complement fixation reaction can be demonstrated in nearly all cases by the end of the second week. The relationship of the Bordet bacillus to the influence bacillus is a very close one, and there are seen clinically cases in which symptoms often indistinguishable from pertussis, via. a contagious catarrh and a parcocyonal cough lasting from four to six weeks, are associated with the presence of the influence bacillus but without the Bordet bacillus.

Proximity to a patient eccus all that is required to communicate the disease and even close proximity is not necessary. Comy places the infective distance at about five feet from the patient. The disease scens to be spread chiefly by droplets diffused by coughing and specing.

Predisposition.—Fully one-half the cases of pertussis occur during the first two years of life. The following are the statistics of Smbo (Bula-Pesth), showing the ages at which the disease was met with in 4,391 cases, comprising the records of one clinic for thirty-four years:

Under one year	There to four years	004 came
One to two years		
		199 #

The enceptibility of young infants to pertuosis is very great. To them unquestionally the disease may be carried by a third person. Many cases are on record in which pertuosis has occurred during the first menth, and one has come to our notice where a child techer days add was attacked, whose mother was suffering from the disease. The disease is nearly twice as frequent in the number and spring as in the summer and autumn. Epidemics of pertuosis often occur at the same time with or follow those of mensles.

The susceptibility to pertussis is very great, and is equalled only by that to meades. Biedert reports that of 401 children exposed during an epidemit in a certain tillage, 340, or minely-one per cent, took the disease.

As a rule one attack protects the individual during his life. The great majority of the reported instances of second attacks are certainly to be explained by mistakes in diagnosis. These may be almost unavoidable; for it is at times almost impossible to distinguish true pertussis from the purceyonal cough which occurs in some cases of influenza.

Infective Period.—Pertussis may be communicated from the very beginning of the exterrhal stage; it is more contagious at this period than later. There seems little doubt that it is contagious throughout the spannedic stage, but the infectivity of the discuss after the first few weeks is slight. The recurrence of the whoop with a first cold, after it has ence ceased, cannot be considered a relapse nor regarded as contagious. Quarantine is generally required for two months. The usual source of the contagion is the patient, rarely the room or the clothing.

Incubation.—The very gradual outst of pertussis renders it impossible in the majority of cases to fix the stact date, and hence to establish the definite duration of the period of incubation. In cases where this could best be determined it has usually been from seven to fourteen days, or about the same as in measles. If, after an exposure, sixteen days pass without the development of a cough, the probabilities are very strong that the disease has not been contracted.

Letiens.—The only constant besion of pertussis consists in a catarrhal inflammation of varying intensity, which affects the mucous membrane of the larynx, tracken, and brouchi, and sometimes that of the nose and plarynx. Mallory claims that the presence of the bacilli between the riliae of the epithelial cells of the tracken and brouchi is the specific lesson. Others have found a similar condition in influence. If the child this during a paroxysm, either with or without convulsions, the brain is found intensely songested and may be the sent of punctate hemorphages, at even larger extravasations. The lungs always show emphysema if the attack has been severe or protracted. The other palmentary lesions

are due to complications, the most frequent of which is broughopenmonia. Catarrhal enteritie and colitie are not infrequent.

Symptoms.—The symptoms of pertuson are usually divided into three stages—the catarrhal, the spasmedic, and the stage of decline.

The outerhal stage continues on the average for about ten days, although cases show considerable variation on this point. Some children whosp almost from the very beginning of the disease, while others may cough for three or four weeks before a typical whosp is noticed. The symptoms in the beginning are indistinguishable from those of an ordinary attack of subscate trachesbrouchitts, and unless there has been an exposure to pertussis no suspicion is excited. After free or six days, however, the cough, instead of abating as in an ordinary cold, gradually increases in severity and occurs in parexysms. At first these are mild, and there are only two or three a day, but they gradually increase in frequency and severity until the typical whosp is heard which marks the beginning of the spasmodic stage. During the first stage there may be symptoms of a mild grade of enterphal inflammation of the nose, pharmy and larges, and often there is a slight elevation of temperature.

The Spansodic Stage. In a typical parasym of average severity the child, who can usually forestell it, will often run for support to the lap of the mother or the nurse, or seize a chair with both hands. There now occurs a series of explosive coughs, from ten to lifteen in number, coming in such rapid succession that the shild can not get his breath between them; the face becomes a deep-red or purple color, sometimes almost black; the veins of the face and early stand out prominently; the eyes are suffused, and seem almost to start from their suckets; there follows a long-drawn inspiration through the narrowed glottis, producing the crowing sound known as the whosp; and then another succession of rapid coughs follows and another whosp. In a single severe paracram, which lasts several minutes, the child may whose half a doors times; with the final paroxyem a mass of tenacions mucus is usually brought up. In a young child romiting is almost certain to follow, if food has been recently taken. Epistaxis semetimes occurs with nearly every severe paroxyum, but in most cases the bleeding is slight. After a severe attack the child is at times so exhausted as to be hardly able to stand. There is profuse persperation; his mind is confused, and he may be completely daned. In infants the attack may result in a degree of aspliyais requiring artificial respiration. Those old enough to downle their sensations tell of a sense of impending suffocation, the suffering from which is almost indescribable.

The number of severe parotysms or "kinks" in twenty-four hours varies, according to the severity of the case, from half a down to fetty or fifty. There are always many more of a milder form. Paroxysms are often excited by eating or drinking anything cold, by a draught of air, or by imitation; they are usually more frequent during the night than the day, and in a close room than in the open air.

In less severe cases no parroysms of the grade above described may seeur, and no typical whoop may be heard throughout the attack; but the parcoysmal nature of the cough which continues until the plug of macus is expelled, the watery open, and the comiting which follows a parasyan, stamp the disease as pertuses. In young infants the whoop is frequently not marked. The child constitute coughs until he is asphysiated, and yet no whoop occurs. The puroxyons are also modified by intercurrent disease, especially by attacks of postmenta or severe boundation. At such times they usually become less frequent and less typical, and may be absent for averal days, returning as the complication subsides.

The seat of the irritation which produces the cough has been varionly located by different observers. Some have thought it to be in the som, others in the tracken, the bronchi, or the larynx. It is very probable that it may not always be in the same place and that the infectious estarrit, which is really the most important element in the disease, may tary in its intensity and location in different cases. The weight of evilence seems to be that in the great majority of cases the source of irritation is in the larynx or tracken. From laryngoscopic examinations made during the disease, Von Herif found the mucous membrane of the laryax to be swellen and congested, and occasionally the seat of small bemorthages or superficial pieers. He states that the frequency and severity of the paroxyens corresponded with the degree of laryugitis, and he found that a parexysm could always be excited by irritating the mucous membrane between the arytenoid cartilages. During a paroxysm he served that there was a collection of mneus on the posterior laryngeal. wall, the remotal of which had the effect of shortening the paroxyon.

Rasshash made laryngoscopic examinations, with negative results so far as the larynx was concerned, but he states that a plug of muons could always be seen in the lower traction for one or two minutes before the peroxyem occurred. There is little doubt that this collection of nucus is the exciting cause of the paroxyem, as it is a familiar clinical fact that the puroxyem continues until this is dislodged.

The average duration of the spasmodic stage is about one month. It increases in intensity for the first two weeks, remains stationary for about a week, and then gradually durinishes in severity. The course and furation of this stage are, however, subject to wide variations. In mild thus it may last only a week; in severe cases, especially in the sinter

season, it may continue for three months, at times almost subriding, but lighting up again with all its previous according with every fresh catarrhal attack. After it has entirely ceased the whoop may return with an attack of brenchitis, and continue for a month or more. This is not to be regarded as a true relapse of pertussis. The habit of the paronysmal rough once established, it tends to recur with every slight breachitis, often for months afterward.

The Stage of Decline.—Gradually the overity of the parayems shates, the whoop crases, and the cough resembles more and more that of ordinary broughtin. This stage usually continues about three weeks, but may be prolonged indefinitely in the winter months.

Complications.- Hemorrhages.-The bestorrhages of pertunis are mechanical, and depend upon the intense typous congestion which accompanies the paroxysm. Epistavis is the most frequent variety, and occurs in a considerable proportion of the severe cases, in a few with almost every severe paroxysm, but it is rarely severe enough to require local treatment. Hemorrhages from the mouth may have their origin either in the pharyny or the brought, the blood being brought up by the rough; such Ismorrhages are usually small. Conjunctival henorrhages are less frequent, and are usually slight, although we have seen the entire conjunctive covered. In a case under our observation there was bleeding from both curs with every severe paraxyons for more than a week. This child had previously suffered from scarlatinal offitis, with perforation of the drum membrane. Small extravasations into the cellslar tions beneath the eyes are occasionally seen, giving an appearance somewhat like an ordinary "black eye." Intraeranal hemorrhages are not frequent, but many examples have been recorded, and they may be severe enough to produce death. They are usually meningeal, very rarely cerebral; according to their extent and location they may produce homiplegia, monoplegia, aphasia, facial paralysis, or disturbances of eight, hearing, or sensation; in midition, there may be convulsions or rigidity, but rarely complete come. The extravasations are senetimes small and the symptoms which they produce may disappear at the end of a few weeks. More extensive hemorphages cause serious results. In almost every instance these honorrhages have scentred at a direct poult of the sovers purocyons. Purpora homorrhagica is occasionally seen as a sequel of pertussis.

Respiratory System.—The most serious complications of pertunis are connected with the lungs. By far the largest proportion of deaths is due to pulmonary complications, usually broachapusumonia. This is more frequent in winter and spring than in the summer months, and is especially to be dreaded during infancy. In later childhood lober research ments is occasionally seen. Provincein rarely begins before the second work of the disease, and most frequently develops at the height or toward the close of the spasmedic stage. The physical signs present no pseudiarnies; the cough changes somewhat in character during the personnella, and the shoop may not be heard. The progness of the personnella tad, because of the debilitated condition of the children at the time of its occurrence. A great danger is from the supervention of convalsions, this being a frequent mode of termination. As there is always considerable emphysems, the supplicity of breathing is frequently out of proportion to the temperature, which often is only moderately elevated. If the child secapes the dangers of the scate stage, death may still occur from exhaustion, owing to the protracted course which the disease frequently time.

Brunchitis of the large tubes is present in almost all the severe cases, and is not of itself serious. Broughitis of the small tubes has the same dangers and the same complications as broughouseonica.

Vesicular emphysema is invariably present in every case of pertussia which comes to autopsy. A certain amount of it certainly occurs in every severe case. It is produced by the forcible cough of the puroxysm. In very severe cases interstitial emphysema is also found. Rapture of the air-blebs which form on the surface of the lung may lead to emphysema of the cellular risons of the mediastinum, and the air may find its way along the great vessels into the neck, and finally into the subcutamous cellular tissue of the entire body. Cases of general subcutamous emphysema have been reported by Greker and by Hodge, both of which ented fatally, one in three and one in eight days from the beginning of the emphysema. In the great majority of the cases vesicular emphysema a not permanent.

Bigories System.—During the summer, infants with pertussis are almost certain to suffer from diarrhos; it may be only an occasional employ, or the attack may be excee and prolonged, resulting in the lawlepment of ileocolitis. The intestinal complications may be almost as serious in summer as are those of the respiratory tract in winter. Youriting is even more frequent than diarrhon, and while it may be distrough at any ago, it is especially so in infancy. So frequently does the taking of food excite comiting, that the notrition of these patients often becomes a matter of the greatest deficulty, and in fact the most serious problem in the management of a case. Mahastrition and even marasmus may follow, or the general resistance of the child may become so reduced by lack of food that he falls a ready proy to passimonia.

Nervous System.—There may be conventions, come, paralysis, aplants, disturbances of eight or hearing, and in rare cases even the

mental condition may be affected. The most serious of these complications are conculsions. They are much more frequent in infancy than later, and particularly in those who are mobilite, in whom they are often fatal. Convolvious are of course more common in severe attacks, but they may occur suddenly when there has previously been no cause for anxiety. They are especially to be directed if presumonia is present. The attack of convulsious may be the culmination of the extreme degree of nervous irritability which accompanies the paroxysm, it may be due to asphysic or to an intracranial besize; if the latter, there is usually meninged hemorrhage. This is to be suspected if there are continued convulsions for several hours, with general rigidity or hemiplegia.

Disturbances of sight are not infrequent in severe cases; usually these are transient, but there may be blindness lasting two or three days or even weeks. The transient symptoms depend most likely upon eigculatory changes that occur in the brain during the parexysm, while those which last for two or three weeks are probably due to meningeal bemorrhage. Disturbances of bearing are rare. The different ferms of paralysis occurring with pertuson may likewise be transient or permanent. They are to be explained in the same way as the disturbances of the special sences. The most common form is hemoplegia.

Albuminuria is not infrequent, being found in sixty-right of eightycits examinations by Knight. The quantity of albumin is rarely large, and it may be accompanied by a few hyaline casts. Both are probably the result of circulatory disturbances in the kidney. Other complications of pertussis are bernia, prolapsus ani, and ulcer of the fremum linguas.

Diagnosis.-The only constant features of pertussis are the course of the discuse and its communicability. In many cases the typical whoop is never heard. There are no symptoms by which a positive diagnoss can be made in the extarrial stage; but a cough not accompanied by fever or physical signs, which steadily increases in severity for two works, in spite of treatment, and which occurs cloudy at night, is always suspirious. When, in addition, the cough begins to come in paroxyems, atcompanied by suffusion of the face and occusionally by vomiting, there can be little doubt even though no whosp is heard. If the disease is prevalent the diagnosis is practically certain. Mild cases which do not go even as far as the symptoms mentioned are most pursling. But if there is a history of exposure, if the cough continues from four to six weeks. little influenced by treatment, and if other typical cases follow, the disease must be pertussis. Without evidence of communicability, herever, one may be in doubt oven after the disease is over. In certain cases of influenza there may be a parenty-small cough which by its symptoms

and course can not be distinguished from pertusors, but which may be recognized by an examination of the blood and sputum (vide Influenza).

In early infancy any cough may have more or less of a spasmodic character, and a fairly typical whoop is often heard in the course of an ordinary trunchetts. We have several times seen abortive or very short attacks in one member of a family of children, the others having the disam in a typical form. Occurring by themselves such cases can not be recognized.

Irritation of the pneumogastric or recurrent laryngeal nerve from taberulous trackeal or broachial lymph nodes, or from a foreign body in the air passages, may give rise to a spasmodic cough, which in certain case may be indistinguishable from pertuose. The prolonged duration of the symptoms is sometimes the only diagnostic point; but the parcayens are usually not so severe as in true pertuosis, and the course is

generally less typical.

The blood examination is of much assistance in diagnosis. The leasurytesis accompanying pertussis far exceeds that of any other afebrile tissues of the respiratory tract. It appears in the early part of the convolve stage, and disappears slowly with improvement. The total rount is nearly between 15,000 and 30,000, although it may reach 20,000. There is a great increase in the lymphocytes at the expense of the polymorphomoteur neutrophiles. The lymphocytes may form 60 to 80 per cent of the total lencocytes. The lencocytosis is little influenced by complications, and even during brouchopseumenia the lymphocytes may continue to be in excess.

Programis.—The most important factor in the prognesis of the discase is the age of the patient. After the fourth year it is indeed rare
that either a fatal result or serious complications are seen; but during
induce, and particularly during the first year, there are few discuss
more to be dreaded. This is especially true on account of the connection
of whosping-cough with the three most fatal conditions of infancy
—boundopneumonia, diarrheal discusses, and convulsions. Fully twothirds of the deaths from whooping-cough secur during the first year of
life. The prognosis is very much woose in infants under three months
thin in those who are other and consequently have more resistance. It
is better in the summer than in the winter, because branchopneumonia
is then less frequent. It is particularly had in delicate infants, in those
who are rachitic, in those who are prone to attacks of broachitis, in
those who have suffered previously from pneumonia, and in those with
a strong tendency to tuberculosis.

The exact mortality of whooping-cough it is difficult to state in figtors. During the first year of life it is probably not far from twenty-five per cent, although at diminishes rapidly after this time. In foundling asylums and hospitals for infants it is to be ranked among the most fatal discusses, and in some epidemics the mortality in such institutions is as high as fifty per cent.

Fully two-thirds of the deaths during whosping-cough are from bronchopneumonia; the next most frequent cause is diarrheal diseases. Convulsions may be the mode of death in either of the above conditions, or may occur apart from them. During the first year, death often results from marasmus, the child having been reduced by the prolonged disease, Occasionally death is due to asphyxia following a severe paraxyam, to intracranial hemorrhage, or to general emphysems.

As a predisposing cause of generalized inherculosis, pertusts is secoud only to number. In both diseases inherculosis develops in much the same way and from practically the same causes.

Prophylaxis.—Pertussis is a contagions disease, and a child suffering from it should be isolated from other children whenever this is possible. Children with pertussis should never be allowed to attend school, and needless exposure should always be avoided.

Young infants, delicate children, and those with a prelimposition to inferculosis, should be most carefully protected against exposure, since it is in them chiefly that the disease is likely to be seriess. As it is from the patient that the disease is nearly always contracted, there does not exist the same necessity for the careful disinfaction of apartments as after other contagious diseases. In institutions, however, this should always be practiced, and in private houses if the room is subsequently to be occupied by an infant. The prophylactic use of vaccines is referred to under Trentment.

It is as undesirable as it is impossible to confine a child with pertussis to a single room during the attack; all those persons for when exposure would be dangerous should therefore be sent away from the bonse. Quarantine should continue for at least six weeks, or until the spannolic stage is over.

Treatment.—We have as yet no specific remedy for pertunis. The important thing in most cases is the hygiene or general management of the case; fully half of the cases seen in practice require nothing more. Much harm is done by indiscriminate drug giving.

General Monures.—Fresh air is important throughout the attack. It is almost invariable that the paroxysms are fewer while patients are out of doors, and more frequent when they are in close rooms. Older children with pertusois may go out even in winter except on storney, new, or windy days. With infants and delicate children, however, the contour treatment in cold weather so enthusiastically advocated by some writers should be used with the greatest cuntion. It should not be permitted

if the patient has even the slightest amount of bronchitis. Our experience is that during the winter in a climate like that of New York or New England, the class of patients just referred to are better off indicors, taking their airing in their rooms. In warm weather or in a mild climate all children should be kept in the open air as much as possible.

A change of climate is desirable when the cough is unduly prolonged, also for delicate children in winter. A warm place at the sensione is are which is most likely to be iscueficial. The improvement following a sea voyage is often very marked, surpassing even a residence at the sensione.

The rooms occupied by children suffering from pertussis should be frequently changed, thoroughly aired and cleaned. A change of rooms, defining, helding, etc., sometimes exerts a marked influence on the course of very prolonged attacks, the inference being that continued re-infertion takes place. Such a change should be made twice a week, and it is of special importance in hospitals, where many children quarantized in a single ward seem to cough interminably.

Careful feeding and attention to the bowels are matters of the greatest importance; with infants particularly, chronic indigestion and abdominal distention have a very marked effect in increasing the frequency of the paroxysms. The abdominal support furnished by a snugly litting band, adds materially to the consfert of the patient in a severe attack. Feeding is difficult since rounting occurs so meily. In most asso it is necessary to repeat the meal in a short time, if the first one has been vomited. Children over two years old should in all such cases to kept largely upon a fluid diet; the meals should be smaller and more frequent than in health. For infants, milk should be modified according in the child's digestive symptoms. Any medication which causes disturbance of the stomach should be oresited.

Local applications to the rhimopharyux or to the laryex by means of a spray or small have been advocated by many. We have never seen the bracketal results claimed, and believe them to be exaggreated. The application of cocain to the laryex should under no circumstances be employed in young children.

Inhalations are of much more value. They are useful to modify the extern by allaying irritation, facilitating the expulsion of the mucus, and possibly as antisoptics. These most employed are crossote and crossible. In our experience crossets is the best. These substances may be used upon cotton in a respirator, or superized over an alcohol lamp. The possibility of absorption should not be forgotten, and the urine should be watched. When the paroxysms are frequent and of great severity, chlorolam may be used to word off convolutions or prevent dangerous asphysis. In such conditions O'Dwyer used intuhation with striking benefit. The

tule entirely overcomes the glottic spasm which is the chief cause of suffering and danger.

Interset Medication.—Of the immunerable drugs which have been recommended for this disease, there are two which possess underbied advantages over all teleors, viz., bellationna and antipyrin. In giving belladonna it is important to begin with a small dose and cautionaly increase both its frequency and size. To an infant two years old, one-fourth of a minim of the fluid extract may be given every four hours as an initial dose, gradually increasing to every two hours; if stropin is need, gr. 1-800 may be given in the same way. Although beliefound usually has a decided industric in reducing both the frequency and the severity of the pareoxysms, it causes many unpleasant symptoms, and its effects must be closely watched.

Antipyrin has been in our experience more generally useful than any other single drug. It may be given with safety, even to young infants, in considerably larger doses than are arbitrarily suppleyed. For a child six months old the initial dose may be one grain every three hours; later this may be given every two hours. For a shild two years old the initial dose may be two grains repeated-every four to six hours, gradually increasing up to two grains streng two hours. Should premionia develop, the antipyrin should be discontinued. A combination of the brand of selium with antipyrin is often better than the latter given about.

Nearly all drugs which allay nervous irritability have a certain aurount of effect in controlling the purceyons of pertusses; codes citional, and trional are useful where the night attacks are so were as to prevent sleep. We do not believe that any form of internal medication or local treatment shortens pertusses; but, inasmuch as the disease is self-limited, great benefit to the patient results from the reduction of the number and the diminution of the severity of the paroxyems.

Faccines have been much employed in the treatment of pertusois during recent years with exceedingly variable results. Vaccines made from
stock rultures of the Bordet-Gengou bacillus have been most widdly
used. Several facts militate against success by this treatment. Int,
our uncertainty regarding the bacterial cause. While the Bordet-Gengon bacillus has been altegether most frequently found, a puroxyanal
cough which clinically is indistinguishable from pertuson may be have
cinted with the different forms of so-called homoglobinophilic bacteria.
In the second place there are apparently several distinct strains of the
Bordet bacillus. The oridence as to curative value of vaccines is as you
inconclusive. There is somewhat more evidence that they are useful as
a means of prophylaxis; but this point is by no means established. However, inasmich as they are harmless the use of vaccines is advisable as
a proventive measure in the case of young infants expand. The question

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of therapeutic desage is still unsettled; from 25 to 100 millions, according to the age of the child, repeated every two to four days is at present to be advised. For prophylaxis full doses are also needed; they should be repeated for three or four doses at intervals of five or six-days.

In establishing the value of any method of treatment, it should be remembered that the number of cases in which the duration of the disease is short is quite large, and also that almost any method of treatment if employed after the attack has reached its height will be thought beneficial, as the natural tendency is then to improve. The value of any particular line of treatment is to be judged in a given case only by its effect in reducing the number and severity of the paroxysms. This ought to be readent in the case of drugs or vaccines within a few days, and can only be determined by keeping a careful record of the number of severe paroxysms day and night.

In a mild case, when the number of paroxyens does not exceed eight or ten during the day, when there is no wanting and the general health ir not affected, it is not assully advisable to continue the administration of any drug throughout the disease. A single dose of antipyring to social at night may be all that is necessary. All cases in infants must be watched with great care and the parents warned of the possible dangers which may supervine sublenly, even in the course of mild attacks. For severe cases antipyrin should be given to diminish the Impensy and the severity of the paroxyens, and inhalations of ercosote and if much natural is present. All the fresh air possible should be allowed, but without exercise. For sider children the same plan of treatment may be followed, or quinin or belladenna may be substituted for the unitiperix.

As these drugs are given solely for the purpose of diminishing the frequency and reverity of the purceyons, their continuous use should be deferred until the symptoms are sufficiently severe to greatly disturb the child, the benefit at this period being more striking than if they are legan carly and used continuously.

CHAPTER VII

MUMPS.

(Epidense Paratitis)

Mrmrs is a contagious discuss characterized by swelling of the puroble, and sometimes of the other salivary glands, with constitutional comptons which are usually mold. Both severe complications and a fatal termination are extremely infrequent. The disease is not a very common one, and general epidemics are not common.

Pathelogy and Lesions.—The contagious character, regular incubation period and typical course, stamp the discase as a general one due to a specific organism, but this has not been definitely determined. Unquestionably the virus is present in the saliva of affected persons and in all probability the poison is eliminated by Stene's duct. By inoculating the saliva from patients with murops into the parotial gland of cats, Wallstein has reproduced a similar disease in these animals with typical symptoms and transferred this again to other aximals with the predaction of the same symptoms. It has long been a popular tradition that slottestic cats were occasionally the subjects of numps.

The precise nature of the charges in the gland is still a matter of dispute, as opportunities for pathological examination are very rars. From existing evidence it would appear that the gland substance is first involved, and afterward the surrounding connective tissue. The gland is the seat of an intense hyperemia and edenue; the walls of the salitary ducts are swollen, and the ducts are obstructed. While the primary discase does not tend to excite supportation, progenic germs may occasionally gain entrance and an abscess form; but this is to be regarded as a rare accolerate infection.

In the great proportion of cases the parotide alone are affected, although the same changes are occasionally found in the other salirary glands. There are no other essential lesions of the disease, those which are found depending upon complications.

Etiology.—Mumps is speed by contagion, close contact being usually required to communicate the disease, although it is known to have been carried by a third person and even by clothing. The susceptibility of children to the posson of mumps is much less than is the case with the other contagious diseases, so that only a small number of those who are exposed take the disease. The greatest predisposition is between the fourth and fourteenth years. Indants are rarely affected, although a case in a child three weeks old is conched for by so good an observer as Denome.

Mamps is contagious from the beginning of the symptoms. Two
cases have come under our notice in which the disease was communicated
before any swelling was seen. It is impossible to fix with certainty the
duration of the infective period. The disease is undoubtedly communicable for a few days after the swelling has sate-ided; and for safety a
case should be isolated for three weeks from the beginning of symptoms,
or one week after the swelling has disappeared.

Incubation.—In forty-eight collected cases in which the incubation was definitely determined, it turied between three and twenty-fee MUMPS 1017

days. It was less than fourteen days in only four cases, and in twenty-six of the forty-eight cases it was between seventeen and twenty days. In three cases of our own in which it could be definitely fixed, the incubation was nineteen days in one case and twenty days in two rates. The average period of incubation, then, may be stated to be from seventeen to Iwanty days.

Symptoms.—In the milder cases the local symptoms are the first to attract attention; in those which are more severe there are frequently profromal symptoms of from twelve to forty-eight hours' duration-accepta, headacle, comiting, prims in the back and timbs, and fever. Softmann has reported a case ushered in by consulsions. The initial temperature in a mild attack is 100° to 101° F.; in a severe one, from 100° to 104° F.

Of the bank symptoms, the pain usually precedes the swelling; it is pereased by movement of the jaws, by pressure, and sometimes by the presence of acid substances in the mouth. It is usually referred to the posterior part of the jaw just below the ear. The swelling may begin smaltaneously in both pareties, but more frequently one sole is involved a day or two in advance of the other. It usually reaches its maximum on the third day, remains stationary for two or three days, and then subsides gradually. The degree of swelling varies with the severity of the attack. When it is marked, the patient may be so changed in appearance as express to be recognizable. The swelling fills the lateral region of the peck between the jaw and the sternomistoid muscle and extends ferward upon the face to the aygomatic arch; so that the center of the turner is usually the lobe of the ear. The other salivary glands may swell simultaneously with the purotide, or several days later, even after the parotid tumor has disappeared. Occasionally swelling of the extraxillary or the sublingual glands occurs before that of the parotid, and in care instances these may be the only glands affected.

As a rule, the paretid of each side is involved. Of 282 cases both sides were affected in 215. When one side alone is involved, it is the lift a little more frequently than the right. The interval between the swelling of the two sides may be a week, or even five or six weeks, but usually it is only two or three days.

The salivary secretion is usually very much diminished, and the dry most causes great discomfort. Exceptionally, distressing salivation cours.

Although as a rule the patient is not seriously ill, mnmps may in tare cases produce most alarming and even dangerons symptoms. The temperature may for several days reach 104° F, or more, deglutition may be extremely difficult, pressure on the jugular veins may lead to venous hypermia of the brain, cousing headache and sometimes delirium; there is sometimes great prostration and the symptoms of the typhoid sandition. These severe attacks are nearly always in patients over twelve years old.

The constitutional symptoms of mamps usually last from three to five days; the swelling continues on an average about a week. If the case has been a severe one, slight swelling may continue for two weeks ar even longer. Belapses, in which the opposite side from the one first affected is involved, are quite frequent, occurring in about ten per cent of the vacou.

The blood findings in manage are quite characteristic. The botal lencocytes vary considerably; they may be normal or there may be a kursepensa throughout the disease. There is a constant reduction in the polymorphomicleurs and an actual and relative increase in the lymphocytes.

Complications and Sequelae.—In childhood the complications are few and usually unimportant; but in adolescence they are occasionally empores. Orehitis is exceedingly rare in childhood; of 219 cases observed by Rilliet and Burthez, this was seen in but ten, and only three of these cases were in children under fifteen years, and no case in one under twelve years old. When orehitis occurs it is generally toward the end of the second or the beginning of the third week; it is usually marked by an accession of fever, sometimes by a chill; if severe, nervous symptoms may be present. The body of the testiels and not the epididymic is generally affected. The acute symptoms continue for three or four days, and the entire duration of the attack is about a week; although the testiele is often enlarged for some time afterward, and strophy of the organ may follow. When orchitis is double, sterility may be the consequence.

In females, congestion and swelling of the brands, ovaries, or latin majora may occur; and, although these complications are all very rate, most of them have been observed oven in young children. The interrelation between the paretids and the sexual glands has not yet received a satisfactory explanation.

Nephritis has in a few instances followed mumps, sometimes coming on as late as four or five weeks after the attack. Single cases have been reported by Croner, Isham, Hensch, and others. Nervous sequelar are more frequent, but even these are rare. We have seen multiple neurina in a boy of tredre which developed two weeks after a severe attack of mumps. The paralysis was general, lasted for six weeks, and was fellowed by complete recovery. Juffrey has reported a similar rare. Facial puralysis three weeks after mumps has been reported by Hillier, apparently due to an extension of inflammation from the gland to the senath nerve. Meningitis may occur as a complication of mimps. We have MUMPS 2029

seen one such case accompanied by high forer, delirium, spirithotomus, and a turbid cerebrospinal fluid containing a great many polymorphonactuar rolls. It was, however, sterile. The child recovered after five days' illueus.

Pource has collected an interesting series of forty cases of deafness following mumps, in which there was no sign of otitis, the symptoms coming on suddenly with tertige, a staggering gail, and often with rounting. In most of the cases the deafness was unilaberal and the loss of hearing was permanent. The cause assigned was disease of the autitory nerve, the sest of the trouble being in the labyrinth. Toyubee has reported an instance of hemorrhage into the labyrinth. Otitis media a rarely seen.

Supportation of the parotid gland occurs in about one per cent of the cases, and is probably due to accidental infection. Gaugene and sloughing of the parotid were observed twice by Demme in 117 rases; both of these proved fatal. Preumonia, meningitia, endocurditia, and pericarditia have been observed as complications of mamps, although all are extremely rare.

Prognesis.—In the great proportion of cases mampe is a mild discase, and terminates in complete recovery in a few days. In young children complications are infrequent, and these which occur are rarely sense.

Biagnosis.—Mamps is most likely to be confounded with acute swelling of the cercical lymph nodes. In a parotid swelling, the lobe of the our is near the center of the tumor, which extends backward to the stemmasticid muscle and forward upon the face as far as the sygomatic trib, entracing the angle and ramus of the jaw.

A swellen lymph node is usually entirely below the ear and behind the jaw, not extending upon the face. The tumor is generally smaller and more circumscribed if only a single node is involved, and it comes on much more slowly than does mumps. When only the submixillary or sublingual giands are affected, the diagnosis from swellen lymph nodes in seastiness impossible except by the course of the disease. Mumps is characterized by the rapidity with which the swelling occurs, and by its relatively short duration.

Treatment.—The disease is self-limited and the individual symptoms mady distressing, so that in most cases very little treatment is required. If constitutional symptoms are present the patient should be kept in sel, and if there are none he should be confined to the house. The gland should be protected by flaunce or absorbent cotton, and if the pain is severe heat abould be applied. The diet should be liquid, on account of the pain produced by masticution. The mouth should be kept clean by the use of some antiseptic mouth wash. The general symptoms and com-

plications are to be treated according to the indications presented. Cases of mumps occurring in schools or institutions should be quarantized for three weeks, and in private practice where there are susceptible persons. Fungigation and disinfection after an attack are unnecessary.

CHAPTER VIII

DIPRITRERIA

Departmenta is an acute, specific, communicable disease due to the bacillus of Klebs and Loeffer. It is usually characterized by the formation of a false membrane upon certain museus membranes, especially those of the tensils, pharynx, nose, or larynx. Like other pathogenic organisms, however, this germ acts with varying intensity, and may cause inflammation of all degrees of secerity, from a mild catarrhal sugina to the most serious membraneous inflammation; but to all alike the term diphtheria should be applied. In its mild form it may be almost without constitutional symptoms; but in its severe form it is attended by great general practitation, cardiac depression, and anema; it is frequently complicated by procursonia and rephritis, and it may be followed by localized or general paralysis; it then constitutes one of the diseases most to be dreaded in childhood.

Etislogy.—The Berillan Diphtherine.—This was first described by Klebs in 1883, and during the following year it was isolated by Loefler and shown to be pathogenic. It is a Gram-positive bacillus and varies rensiderably in size and shape even in the same culture. In a specimen it occurs singly or in pairs, sometimes in chains of three or four; the bucilli may lie parallel, but frequently two form an acute or an obtuse angle. They are straight or slightly surved, and sometimes branching; they may be swallen or club-shaped at their ends.

Distribution and Mode of Communication,—In most large cities diphtheria provails endemically, with periods in which outbreaks of considerable severity are observed. In the country it prevails thirty as an epidemic. The disease is often introduced into remote districts in some mexplicable manner, and before its nature is recognized a large number of persons may be exposed, and an epidemic results.

Diphtheria does not arise de save. Every case has its origin in a previous case either directly or remotely. The bacilit may enter the hody through the inspired air; they may be taken into the mouth with toys or other articles upon which they have lodged, or by kinning, and semetimes by accidental inoculation. As a rule, the bacilli first gain a footbobl upon the mucous membrane of the tousils, nose, or larynx,

Direct infection is the cause in the great majority of the cases. There is no proof that the bacilli are contained in the breath of a person suffering from the disease. They are present in great numbers in the saliva and masses from the mouth and nose, often being distributed by sneezing, roughing, or even by talking. They are contained in pieces of membrane which are discharged; they are not present in the feece. In rare instances they have been found in the urine but in such small numbers as to make it very improbable that this is an important source of infection. The most contagious cases are those of pharyugeal diphtheria on account of the amount of discharge which accompanies them. The least contagious are those in which the membrane is limited to the laryex and lower air passages.

Direct infection may sorur from persons convalement from diphtherin, whose throats still contain virulent bacilli, or from persons suffering from a mild form of the disease, which is not recognized as diphtheria. In the latter way it is often spread in schools. It has been repeatedly shown that a person may harbor virulent bacilli in his rose or throat, and may swe communicate the disease to others, without himself suffering from diphtheria at any time. Such persons are known as "carriers" and are responsible for spreading the disease to many persons.

The length of time during which a patient with diphthetia may contey the disease to others is monewhat uncertain. Transmission is possible so long as virulent bucilli remain in the throat; these are frequently found two weeks after the membrane has disappeared and the patient is regarded as entirely well, and in a few cases they are found for many reachs after recovery.

Indirect infection is uncommon. It may occur from dishes, feedinglattles, or drinking-cops, from swals and brushes used for local applications to the throat; from spoons and tongue-depressers, and from surgical instruments with which trachestomy or intubation has been done. It is undoubtedly very unusual for infection to occur from the bed or clothing of a patient, from corpets, toys, books, etc. Diphtheria may be carried by a third person but rarely, except by one who has been in close contact with the patient—either the physician or nurse—and has not taken sufficient precautions. The frequency of diphtheria in physicians' families hears witness to the danger of infection in this transer.

Bacilli may retain their virulence for an indefinite period. Both Park and Loeffer have found cultures in blood-serum to be virulent after seven mouths; Boux and Yersin, tacilli in dried membrane to be virulent after twenty works, and Abel, upon a child's toy after five months.

Domestic animals may in rare instances be earriers of infection, and,

in the case of pigeons at least, they may themselves suffer from the disease. Diphtheria has been repeatedly spread by milk, but very rarely through the contamination of a water supply.

Predisposing Causes.—Local conditions in the threat influence largely the occurrence of diplotheria. An important predisposing cause is the existence of a chronic cutarriud inflammation of the mucous membranes of the ness and throat, frequently found in children suffering from adetood growths of the pharyux or from enlarged tousils. These adensid growths, the bosoillar crypts, and the cavities of carious both may harlor the bacilli for a considerable time both before and after an attack. The candition of the mucous membranes of the nose and pharyux in other arms infectious diseases furnishes a marked predisposition to diphtheria. Thus is most striking in the case of measies and searlst fever. While diphtheria is seen throughout the year, it is more frequent during the cold than the warm months.

Into unity.-The most important factor which determines if a person who has been exposed is to contract the disease is the presence or absence of immunity. Schirk has shown by means of his test (described later) that many persons who have never had dightheria or received antitorin, alreads have antitoxin, or a substance similar to it, in their blood. Those who pessess this natural antitoxin are immune to the discase, and even though they may harbor virulent diphtheria bacilli in the throat or noss, they never show any clinical evidences of the disease. This natural antitexin is possessed by most newly-born infants, only about ? per cent being without it. Infants gradually lose their immunity; at the end of the first year about 40 per cent, and by the second to third year fully 60 per cent, busy lost it altogether and are consequently sasceptible to the disease. After four years the incolonce of natural autisexin slowly increases so that at the age of ten or twelve years, only about 25 per cent of children are without protection. These figures, obtained lo combining those of Schick and Park, are in accordance with clinical experience. Very few newly-born infants acquire diphtheria, but the number of succeptible children steadily increases with age until about the third year, when it declines. Children from two to six years of age imke up the majority of putients in diphtheria hospitals. Those persons who after the first year possess an immunity prohably always retain it; while these who at ten years of age do not possess an immunity probably will never acquire it. There is no difference in the sense in this respect.

The immunity conferred by one attack of diphtherja is not of long duration, amounting probably to a few weeks or menths only; the passive immunity conferred by autitoxin is still shorter, lasting but a few days or weeks. Even in patients, therefore, to whom autitoxin has been given, a second attack may soont after a brief interval. The incubation of diphtherin is short. In most of the cases in which it could be definitely traced it has been between two and five days. The sirulence of the bacillus varies much in different cases and in different seasons, and while it is frequently true that persons infected from a mild type of the disease have a mild attack, and those infected from a malignant case a severe attack, there is no certainty that such will be the sequence. Park states that, out of many bundreds tested in the laboratory of the New York Health Department, by far the most virulent bacillus was obtained from the throat of a boy who had what was climically a very mild form of tenesillar diphtheria.

Lesiens.—The essential lesions of dipatheria consist not in the production of a membrane, but, as long are pointed out by Ocetel, in cortain acute degenerative changes in the cells of the body caused by the dipatheria toxins. These changes are seen particularly in the spithelial cells of the affected murcus membranes, the heart muscle, the kidney, the liver, the central and peripheral nervous system, the spicen, and the lumph nodes. There are other lesions which are the result of the action of other organisms, especially the streptococcus progresses and the pneumecoccus, either alone, together, or in conjunction with the diphtheria bacillus. The most important lesions due to these organisms are bromboparamenia and nephritis; but there may be found in the blood, and in many of the organs of the body, the evidences of the invasion of these bacteria, i. e., a streptococcus septicemia, less frequently a general pneumococcus infection.

Distribution of the Diphtheria Racillus in the Rody.—Unlike many other pathogenic organisms, the diphtheria bacillus is not in most cases wilely distributed throughout the body. It is found in great numbers on the surface of the affected masses membranes and in the false membrane itself, particularly in its superficial portion, but it does not invade deeply the subjected structures.

The frequency with which the diphtheria lucillus and other organisms are found in the blood and viscers in severe cases is shown in a series of 200 autopsies studied by Councilman, Mallory, and Pearce, of Boston, in 1901. The following table shows the percentage of cases in which the different bacteria were found by culture:

	Heart's Shoot	Lives	Splene	Kidneys,
Diplotheria haefflas. Steptococcus. Staphylococcus sureus. Postmococcus.	6 per cent. 20 4 2.5 1 1.5 1	20 per cent. 30 4 2.5	12 per cent. 27 + 1 + 1.5 +	19 per ovat. 28 5

In this series, 153 were cases of pure diphtheria; 56 were complicated by measles or scarlet fener or both. The streptococcus was much oftener found in the viscera in the complicated cases; otherwise there was little difference in the two groups of cases.

The Diphtheria Torins.-The wide-spread effects seen in diphtheria are due to the action of certain substances called toxior which the highthere levilles couloses during its growth an inocons membranes. They are very diffusible, readily cubering the lymphatic circulation and the blood, and through these shannels may affect the entire body. In susceptible animals there may be produced by the injection of these toxins all the characteristic lessons of diphtheria except the membrane. as well as the exential symptoms of the disease, even including pandyus. For the production of the membrane living bacilli are required.

Calperhal Diphtheria. The routine practice of making cultures from diseased throats has established the fact that catarrhal inflammation may often be the only result of diphtheritis infection. Although to the naked eye there were only the ordinary changes of a sumple inflammation, Octical found the characteristic degenerative changes in the spithelial cells, varying in degree with the severity of the process.

The Diphtheritic Membrane,-The membrane in diphtheria is most frequently even upon the miscons membrane of the toroils, soft palate, avala, pharyax, nose, largux, trackes, and bronch; less frequently upon the month, lips, employus, conjunctives, middle ear, stomach, and genital organs. It may also affect fresh wounds, notably a trachestomy wound, or any abraded entaneous surface. The gross appearance of the membrane varies greatly. It is most frequently yellowish-white or gray, but it may be pearly-white, green, and sometimes almost black. It is composed of fibrin, cells, granular matter, and bacteria. Its consistency varies with the relative proportions of the different elements. When made up chiefly of thrin it is firm and retains its form, often being discharged as a complete cast of the more, largus, or trachea. When the amount of fibrin is small the membrane is soft, friable, and sometimes granular. It is more closely adherent upon the mursus membranes corered with squamous epithelium, as in the pharyax and apper air passages, than upon these severed with columnar and ciliated epithelium, as in the lower air passages,

The microscopical examination shows the fibrin to be sensetimes granular, but usually in the form of a network, including in its meshes small round cells and epithelial cells in various stages of degeneration. On the surface and in the superficial layer there is usually found quite a variety of bacteria including diphtheria bacilli. Beneath this is a colinlar layer containing little or no florin, in which also the dishtherts bucilli are usually found. In the deepest parts of the false membrane and in the process membrane itself the bacilly are few in number or

detail.

Changes which are similar in all the affected mucous membranes, are found in the epithelial cells which undergo marked degeneration with fragmentation of their nuclei; the mucous is infiltrated with loacecytes. The infiltration with small round cells is variable in degree in the different mucous membranes; in some it extends deeply into the submucous and even the muscular layers, while in others it is very superficial. Marked suidences of degeneration are seen also in the rells infiltrating the deeper layers. In places the opithelium is detached, in others the line between the false membrane and the granular mucous membrane is surveily distinguishable.

The Soul and the Distribution of the Membrane.—This varies somewhat with the age of the patient, the season, and the psculiarity of the epidemic.

Our own records show that the larynx is involved in about twenty-five per cent of the cases in children under three years. In general the statement may be made that the younger the child the greater the liability of the discuse to attack the larynx. The larynx and lower air passages are rather more frequently attacked in winter than in summer.

The tonsils are the most frequent and smally the earliest sent of the diphtheritic membrane; it may form here a tough, beatlery patch, partially or completely covering and very atherent to them; or the disease may affect only the tonsillar crypts, so that the gross lesion may resemble that of ordinary follicular tonsillitis. There is in most cases only moderate swelling, but it may be so great that the tonsils are in contact. The surrounding cellular tissue is infiltrated with inflammatory products.

The membrane covering the pharyex and avula is also usually very afterent. The usula is swellen and edematous. Membrane may be seen only upon the fances and usula, or the posterior and lateral pharyegeal walls may be covered fown to the brul of the eracoid surtilage, but generally not below this point. If the posterior pharyegeal wall is covered, the membrane is apt to extend into the rhinopharynx, and even the posterior narw.

The most may be involved secondarily to the rhinopharynx, or the infection may be through the anterior narce; if the latter, it is not infrequently the only part involved. The membrane in the pure much cases is usually thick and tough and often separates on susse.

The observations of Councilman, Mallory, and Pearce have shown that it is very common for the accessory sinuses of the ness, especially the antrum of Highmore, to be involved in fatal cases. It seems highly probable that infection of these parts explains the remarkable persistence of dightherin bacilli in the nose which is accusionally seen.

The epiglattis is swollen to three or four times its normal thickness and the aryteno-epiglottic folds are edemateus. The anterior surface of the epiglottic is rarely covered by membrane; but its lateral borders and posterior surface, and the aryteno-epiglottic folds are involved in most of the severe plantageal cases.

The lesions of the laryax, traches, and brought are similar to the above, although much more superficial. The interior of the laryax may be completely covered, the membrane coating the true and false rocal cods and lining the ventricles of the laryax. The membrane in the laryax is not usually very adherent, and it frequently separates and in roughed up in large pieces or even as a rest. That covering the epiglottis and the aryteno-apiglottic folds is very adherent, like that in the pharyax.

In a considerable number of cases the membrane steps alruptly at the lower lorder of the largus. In the traches it is generally lossely attached, and often it is found at autopsy entirely separated from the nuccus membrane. It is almost invariably associated with membrane is the largus. As a rule, the branchi of both sides are affected, and to the

same degrée.

The extent of the membrane varies greatly in different cases. It may stop at the beforeation of the traches or at the lefurcation of the premary broach); but if it goes beyond this point it is likely to extend to the minutest subdivisions. Exceptionally a very tough fibrineus membrane forms in the traches and broache, of sufficient thickness and consistency to be expelled as a cast, reproducing almost the entire broachied tree.

The buccal cavity is very selfour covered by the membrane; but in
the worst cases of pharyageal disease it may line the cheeks, cover tielips, gums, and more or less of the land palate, but rarely the tenger,
It usually occurs in patrices rather than as a continuous membrane. In
our case we saw the membrane on the lower lip, extending on to the face,
though the boscal cavity was free. It is not common for the diphtheritie
membrane to spread down the digestive tract. In 127 autopaiss studied
by Councilman, Mallory, and Pearce, in which the extent of the membrane was carefully noted, it was found toolve times in the coopingus,
fire times in the stomach, and once in the duolenum. The accompanying changes consist in infiltration, hemorrhage, and cell degeneration.
In the intestines there is often found a hyperplasia of the lymphoid elements—colitary follisles and Peyer's patches—with changes similar to
those in the lymph nodes obserbers in the body, but nothing else that is
characteristic.

The writers just referred to found offits, usually double, in sixty jer cent of 144 autopoies; although in less than one-third of the number was the complication recognized during life. Mustaid disease is infrequent. Offitis in usually the result of direct extension from the pharms. It may be due to the diphtheria bucilius, to the streptococcus, or to both combined. Conjunctival diphtheria is rare and probably due to accidental infection rather than to extension through the backsystal duct. Before the advent of antitoxin, it almost invariably resulted in destruction of the eye; but many cases successfully breated have been reported. Diphtheria may attack any more utaneous surface, especially the arms, prepare, or female positals; any alreaded entaneous surface, or recent wound, most frequently the trackectamy wound of the nick. The diphtheria bacilli have in rare instances been found in pure culture in super-trial absences.

Viscent Lexiston.—The visceral lexions of diphtheria are due partly to the action of the diphtheria toxins and partly to the invasion of the body with other organisms, especially the streptococcus. It is to experimental diphtheria that we one our most accurate knowledge of the former changes, for in human diphtheria the large proportion of all the fatal cases show infection with other organisms.

The visceral lecture of diplotheria consist in wide-spread areas of celldegeneration similar to those which have already been described as accurring in the epithelial cells of the affected muons membranes, together with homorrhages due to changes in the blood-ressels and possibly in the blood itself.

The lymph nodes of the cervical region are the most constantly and the most seriously affected. Similar but less marked changes are seen in the trachesteonchial and the mesenteric groups, and in the lymph nodules of the mucous membrane of the elemach and intestine. There are degenerative changes in the cells of the nodes most affected, with marked infiltration with lenescytes and frequently small hemorrhages. The cellular tissue in the neighborhood of the certical nodes is often extensively infiltrated with cells. The process in the lymph nodes usually terminates in resolution, rarely in suppuration.

The spleen is swollen, semetimes very much so, and deeply congested. Hemorrhages are often seen beneath the capsule; the spleen pulp is soft, the follicles are large, and cell degeneration is quite constantly observed similar to that which takes place in the lymph nodes.

There are frequently small homorrhages beneath the capsule of the liver, and sometimes these are seen throughout the organ. There are found scattered through the liver, areas of necretic hepatic cells; some of these areas are infiltrated with lemocytes.

The kidneys are involved in almost all fatal cases except when death occurs early from laryngeal stenosis, also in nearly every senere cases which terminates in recovery. Acute degeneration of the optibelisms of the takes and the tufts is seen in less senere cases and those of shorter duration, and is the direct result of the action of the toxins. In the more severe and producted cases there is nexts diffuse nephritis of vari-

able type and intensity.

In children dying suddenly in the early stage of the disease, pardiac thrombs are occasionally found. They may form rapidly only a short time before death, or slowly during several days when the circulation is very feeble. Portions of these threshie may be carried into the pulmonery or systemic circulation, causing embelism in any of the arteries of the extremitios, the lungs, or other viscera. Even in the early fatal cases the heart muscle may be seriously affected; in the later ones this is almost constant. The changes consist in a texic myocarditis, the left ventricle being most involved. (See Myocarditie.)

Degeneration of the arteries, especially of the endothelial laper, is

occasionally seen, and there may be infiltration of the adventitia.

Lesions of the brain are rare; both hemorrhage and embolism may be met with. In the spinal cord and membranes multiple hemorrhages occasionally occur. The chief lesion, however, consists in degenerative changes which are found to some degree in nearly all the more severe cases which have been examined. These affect the ganglion cells of the anterior home, the anterior and posterior nerre-roots, and semetimes the pyramidal tracts and columns of Goll. Some writers are of the opinion that the cord lesions are primary and the degeneration of the spinal nerves secondary. However, the general opinion prevails that certainly the less severe cases of diphtheritic paralysis are due to peripheral rather than to central lesions. Degenerative changes have been found also in the preumogastric, spinal accessory, hypoglessal, motor-sculi, and in the cardiac nerves. These nerve degenerations produced by the diphtheria toxin constitute one of the most striking lesions of diphtheria. (See Multiple Neuritis.)

In infants and young children bronchspnermonia is found at autopsy in fully three-fourths of the cases. It is well-nigh constant in cases of diphtheritic leverbilis of the first tules, and is usually present where the membrane has extended to the bifurcation of the traches. The largest factor in the production of paramonia is the aspiration of diplotheria bacilli and streptococci from the upper air passages.

With largugeal stensors, some emphysema is invariably present, and usually it is of the vesicular variety. Rupture of some of the larger blobs may lead to the owape of air into the cellular tissue of the mediastinum or of the rock, which may result in the production of a general emphysems of the subsutaneous cellular tissue.

Black.-There is found in all severe cases of dipatteria a reduction in the number of red cells to the extent of 500,000 to 2,000,000. There is a nearly proportionate reduction in the heatoglebla, this amounting to from 10 to 30 per cent. While the homoglobin falls coincidently with the number of red cells, it is regained much more slowly. Leucocytosis is generally present, and usually proportionate to the severity of the attack, but is occasionally wanting in the most severe as well as in some of the very middest cases. The increase in the leucocytes is in the polymorphomedeur forms. Engel has noted the frequent presence of myelocytes, especially in fatal cases, the proportion of those in some instances reaching sixteen per cent of the white cells.

Symptoms.—The clinical picture of diphtheria is one which presents wide variations, depending upon the principal location of the disease, its severity, and its complications. For practical purposes the following

seems the simplest grouping that can be made:

The mild cases, in which there is either no numbrane, or the
amount of membrane is small and limited to the tomils or to the nose,
with few or none of the constitutional symptoms which follow shorption of the diphtheria poison. These cases particle assentially of the
character of a local disease.

The severe cases in which there are marked evidences of constitutional poisoning from the diphetheria toxin. This term is usually accompanied by an extensive formation of membrane in the pharynx and sometimes in the ness.

 The largugeal cases in which the largest may be primarily or alme affected or in which it is involved accordarily to the severe pharyngal form.

4. The malignant cases. In these cases the symptoms of inflatanation are especially prominent, not only in the plurynt but sometimes in the lymph nodes and cellular tissue of the neck, which may be followed by suppuration or sloughing. This form is frequently complicated by brenchopneumonia even without laryngeal disease, and sometimes by severe neghritis.

Cases without Membrane.—During an epidemic of diphtheria in a family or an institution, cases are frequently seen which present the clinical evidences of only a catarrial inflammation of the nose or plurynx, and jet cultures show the presence of the diphtheria bacillus. Such cases may be examples of simple catarrial inflammation with the accidental presence of the diphtheria bacillus; or the inflammation may be caused by infection with the diphtheria bacillus; but not of sufficient intensity to kind to the production of a membrane. The latter is the view of publishingists, and the one to which clinicians must, it seems, inevitably come.

Catarrhal diphtheria may be either pharyngeal or much. In the pharyngeal cases there are present the usual appearances belonging to a catarrhal inflammation of moderate errority, often accompanied by seeling and tenderness of the cervical lymph glands. The most cases, in our experience, have been most frequent in infants or very young children. Constitutional symptoms may be wanting or so slight us to be overlooked. The only striking thing is a persistent nased discharge which may be seened and frothy, purulent or bloody. It is usually copious, often excertaining the upper lip and semetimes continuing for three or four weeks before any other symptoms are observed. We have several times known it to be mistaken for a symbilitic corpus. Such cases can be recognized with certainty only by cultures. Clinical evidence of their true character is sometimes afforded by the appearance of visible membrane in the ness or pharyux, by the development of group, or by the fact that they cause diphtheria in other children. The bacilli are non-virulent in quite a large proportion of these cases, but in others they are of extreme virulence.

Catarrital dipatheria is not in itself serious, but it may be followed, particularly in young children, by laryngeal diphtheria, or plaryngeal

dightheria may develop in its usual form,

Cases with a Small Amount of Memberne.—Toxillar Diphtherie.— The exudation is usually limited to the toxids and may particle of the character of either followlar or croupous travelliting cometimes there is a slight extension to the funcial pillars or to the pharynx. These cases are quite common, and are more frequent in older children and adults than in infants and young children.

The onset is accompanied by a little soreness of the throat; the initial temperature is from 191° to 103° E.; lest the symptoms are often not severe enough to keep the patient in hed. If seen early, the throat shows slight redness, followed by a gray film, and later lor a gray or white deposit upon the lossils. This may start as a small putch which enlarges, or as small, isolated spots which coalesce or remain separate. The membrane is quite adherent, and can not easily be removed with a seab; usually it is sharply defined. In many cases the patch is not larger than the finger neil. The inflammatory changes in the pharma are slight; a faint red arcola is present at the horder of the putch. The lymph glands behind the jaw may be slightly swellen. There is no mostle discharge and terr little increase in the saliva or mucus from the pharenx. Some constitutional symptoms are present, bid they are not severe. The temperature commonly continues above the normal while the membrane hole, its usual range being from 100° to 102° F. The membrane remains from three to seven days-a shorter time if antitoxin is need. It is very often a matter of surprise that as small an evodate is so persistent. The urine is generally normal. The purents are leath to believe that strict quarantine is necessary in so mild an illness; and when the membrane is only upon the touche, even after the disease has run its course, the physician may be bel to doubt the diagnosis of diphtheria.

In many cases one with experience can usually make an accurate diagnosis from the clinical symptoms alone; but there are many others in which the diagnosis from ordinary tonsillitis is impossible, except by caltures. When diphthesia bacilli are found in those mild cases the question aften arises whether they may not be the non-varulent form. Park tested forty each cases, and found the bacilli to be virulent in thirty-five and non-virulent in five. In twenty of the forty cases the clinical diagnosis was followed tonsillitis.

Sence Cases.—The clinical picture of diphthems is so modified by
the use of autitoxin that those who see it given regularly and early can
have but little conception of the horrors of this disease when not thus
influenced. The error in severe cases may be gradual, even insidious.
There is then a slight indisposition for a day or two, and perhaps some
seriness of the threat; the temperature may be but little elevated, sometimes less than 100° P. The symptoms may steadily increase in intensity for four or fee days, until the maximum is reached. At other
times the disease begins abruptly with ventiting, headache, chilly sensatimes the disease begins abruptly with vention, headache, chilly sensatimes and a temperature of 100° or 100° P. Occasionally, the first thing
to attract attention is the seedling of the convical lymph nodes, which
may be so great that mamps is suspected. The abrupt coset is more often
sem in young shibling than in those who are often.

The membrane upon the tonsils resembles that of the mild form previsually described, but, instead of remaining limited to them, it gradually spreads to the fauces, the lateral wall of the pharynx, the urula, the rhiropharynx, and the posterior mass. In some cases it may cover all the parts mentioned in twenty-four-droars from its first appearance; in others this may require several days. When the nose is first affected there is an abundant discharge of serum and muons, occasionally tagged with blood, which may continue some days before any membrane is vislids.

When a severe case is fully developed there is a very abundant discharge of mucus from the mouth and ness. The tonells, the entire faucial ring, and the pharynx are covered with membrane which is at first gray and gradually becomes darker, often being of a dirty olive-green take. There is obstruction to usual respiration from the swelling of the palate, the tennils, and the tissues of the rhinopharyna; the mouth is half open, the breathing roise, the tongue dry, and the lips are fasared and bleed readily. Occasionally large usual hemorrhages occur which they reconstitute plugging the name. Both restrils are generally blocked by the swelling and the false membrane; the discharge exceriates the upper hip, and frequently has a felid odor. During the second week there may be regargitation of fluids through the ness, owing to paralysis of the palate. The lymph glands at the angle of the juw swell rapidly;

in accept cases they are very prominent, and there may also be extensing infiltration of the cellular tissue about them.

The constitutional symptoms usually increase steadily with the extension of the membrane. In the most serere cases the system is overwhelmed with the poison, and all the evidences of intense toxenia are present by the third day of the discuse. This is shown by great muscular weakness and prestration, he a feeble, rapid pulse, and a mental state of complete apathy or stupor, sometimes alternating with great restlospess. The pulse becomes rapid, weak, and compressible, sometimes irregular; the heart weinds are faint and there is a great and steadily increasing access. The course of the temperature is irregular, and may bear no constant relation to the severity of the other symptoms. Its usual range is from 101° to 103° F., but in some of the worst cases it may never go above 101° F. It fluctuates irregularly with the development of rousplications, and sometimes without apparent cause. By the second or third day the urine regularly shows the presence of albumin, and he the end of the first week the quantity is often large. Granular and healine casts, and occasionally blood in small quantities, are also found. The amount of urine secreted is not noticeably diminished, and droper is ram. Nervous symptoms are seen in all the very severe cases. There may be dulness and apathy, but more frequently, owing to the discembet arising from local symptoms, there is extreme restlessness and excitement, semetimes followed by delirium.

At any time during the first week, but not often after that time, symptoms may arise indicating that the disease has extended to the largus. The first signs of larguaged invasion usually appear from the second to the fifth slap of the disease. Those are at first horseness, a compy cough, and elight dyspace. In the severe cases these symptoms steadily increase until all the signs of larguaged stenosis are present.

The local process in the pharyax scene to be a self-limited one, even when no antitoxin is used. It usually reaches its height by the fifth or sixth day, and after that the appearances do not change materially for two or three days. From the seventh to the tenth day, in favorable cases, the diphtheritic membrane begins to loosen and separate from its attachment. It hangs loosely from the pulate or uvula, and can often be pulled away in large masses. The detachment is frequently rapid, and in two or three days from the time when the first improvement is seen, the tensils and pharyax may be almost free from membrane. The mucous surface left behind is of a bright-red color and bleeds easily. The separation of the membrane in the nose and rhinopharyan takes place may an asset. With the disappearance of the membrane the local symptoms abute rapidly—the discharge coses, the swelling of the lymph

glands subsides, deglintition becomes easy and natural, and mosal breathing is re-established. When antitoxin is given the local process passes through similar stages, but much more rapolly.

Simultaneously with these changes in the throat the constitutional symptoms improve, but much muce slowly. Convaluence is often protracted. The anemia and muscular weakness, and most of all the feeble heart action may persent for weeks. Symptoms due to myscarditis may appear in the second or third week or even later. (See Myscarditis.)

Instead of the usual course just described, the diphtheritic memtense may persist for two or three weeks. In rare cases relapses occur, the membrane forming again after it has entirely or partially disappeared.

The early course of the discuse in the fatal cases often does not differ from that of the severe cases which end in recovery, except in the malignant form, which kills in twenty-four or ferty-eight hours, and which is rare. In very young children death is most frequently due to branchepseumonia, usually accompanying diphtheria of the laryax and branchi. It may also be due to progressive asthenia, the result of diphtherite foremia, or to heart failure.

Laryupeal Diphtheria.—In cases of primary laryupeal diphtheria there are wanting most of the characteristic clinical features which distinguish diphtheria of the pharyux. There are two reasons for this: one is the relatively rapid course of the disease, often producing death from local causes before the constitutional symptoms resulting from the absorption of the toxin have developed; the second reason is, that absorption of the poison by the laryupeal muscous membrane is very feeble as compared with that which takes place from the pharyus. Hence it follows that glandular enlargements, alternature and authenic symptoms are generally wanting; also, that in the cases which come to autopsy only, the parenchymatous degenerations of the heart, kidney, and other segms are seldem found, but instead only such lesions as are connected with the laryupeal disease. The feeble contagion is due to the fact that the course is much shorter, and that the discharge from the nose and much is slight, or absent altogether.

In its onset, diphtheria of the laryax is indistinguishable from naturable inflammation. It is usually somewhat less abrapt, and apparently not quite so severe for the first twelve bours or even for a longer time. There are present the same bearse energh and voice, with slight striker, gradually increasing. The constitutional symptoms are usually not quite so marked, the temperature ranging from 10° to 101° F. The pulse is accelerated, but not weak or intermittent. It is the progress of the disease which indicates its character, usually during the first twenty-four hours. A child beginning in the morning with each symptoms as have been described, may by evening about a decided change for the

worse, or the symptoms may increase with great rapolity during the night. At first the roles is beared; later it is entirely lest. Dyerosa in the beginning is succeds noticeable, but steadily increases hour by hour. Semetimes, from the first sign of hourseness to such extreme disputes at to necessitate intubation may be but a few hours. During the second twenty-four hours all the symptoms are usually well developed. The respiration is often somewhat accelerated, but it may be slower than normal. The face is pale and anxious. The also must dilate with each inspiration. The loud, "sawing," stridulous breathing is present, indicating obstruction both to inspiration and experation. As the dyspura increases, all the accessory massles of respiration are brought into action. There is now with every inspiration deep revesion of the suprasternal form, the supractionicalar regions, and the epignatrium. The child tooses unswelly from side to side in his crib, at times struggling violently to get more air into the lungs. The pulse grows rapid and weaker. There is slight blueness of the finger nails and the lips; the face is usually pule; but later this too may be evanotic. The skin is covered with classing perspiration. On suscultating the chest, very rule requiratory sounds are heard, but no sesicular murmur. As the symptons increase in severity the temperature usually rises gradually, in some very severe cases at the rate of a degree an hour, until shortly below death it reaches 104" of soon 106" F. Late in the disease the intellect becomes dull, the violent struggles for air cease, and the child passes into a condition of semiostupor which gradually deepens until death occurs, which may be proceded by convulsions.

Such is the usual course of the discuss when parelieved by treatment. Its progress is most rapid in infants, in whom death usually takes place in from thirty-six to firety-right hours from the first symptoms. In other children the course is rather slower, and the attack may last from two days to a week, death occurring more frequently from brouchial croup or pacumonia. They are indicated by continued high temperature, rapid respiration, cyanosis, and increased prostruction.

The course of the disease is not always so regular. Occasionally for a work or more the symptoms are precisely like those of enterthal largugitis of moderate severity—homometers, largugeal cough, little or no fever, and slight or occasional dyspace. Then there may be the sudden development of very severe symptoms, and death in a few hours. Great improvement may follow the distolgement of the membrane by comiting or coughing, although in most cases it forms again.

The issue of every case of diphtheritic laryugitis is doubtful. The prognosis is worse in infants and very young children than in those over three years of age. Before the days of antitoxin the mortality of cases not operated upon was from eighty to ninety per cent. Even with mosem methods of freatment the outlook in infants under a year is had; fully firsty per cent die.

It may be difficult in a given case to decide whether the dyspies is he to larvageal inflammation, and whether this inflammation is catarthal or diphtheritic. The dyspues of retropheryageal abscess, of foreign todies in the laryny or trackes, or of bronchopseumonia, may be midakes for that due to laryogitis. But in pose of these conditions should there be any death if a sareful examination is neede and a history altained. Retroplaryngeal absess may be recognized by digital examination of the pharyny; bronchopneumonia by the signs in the lungs, the difference in the character of the dyspoen, and especially by the absence of the noisy strider; in the case of foreign belies, whether they enter through the mouth or consist of alcenting caesons glands which have ruptured into the trackes, the dyspara comes suddenly, and is not accompanied by fever. The main points by which catarrhal largingitis is distinguished from the diphtheritic form have been considered under the former disease. In brief, diphtheratic inflammation may be assumed if there is severe, constant, and increasing dyspnea with sphonia,

Malignant Diphtheria.—The symptoms are usually severe from the outset. The excitation in these cases may be of a yellow, dirty-gray, or dive color, constants being almost black from the presence of blood. The membrane is usually extensive, covering the untire pharynx, often extending to the nose and the middle car, and occasionally spreading to the bureal cavity. There is great seelling of the tonsils and usula, and it is often impossible to obtain a view of the plurynx. Sometimes the inflammation is of a necrotic character, and there may be extensive slenghing of the tonsils, the usula, or the soft pulate. The most discharge is generally abundant, and often offensive. There is marked seelling of the cervical lymph glands, and frequently extensive infiltration of the cellular tissue of the rack, so that the head is thrown back to relieve the pressure upon the largus and traches. The swelling continue forms a distinct collar, reaching from ear to car and filling out the whole space beneath the jaw. The pressure upon the jugular usins leads to congestion and swelling of the face and congestion of the brain.

The temperature is usually high; it follows no regular course, but penerally fluctuates undely from 102° to 106° F. In some cases, however, it may never be above 101° F. In the form characterized by very high temperature there is conclines found a general streptococcus or passunococcus infection, usually the former. The pulse is weak, rapid, and compressible. The peripheral circulation is poor, the extremities are often cold, there is extreme muscular prostration, and both vomiting and diarrhes are frequent. There may be excitement, rectlements, and active felirium, or dulness, apathy, and stuper. Nephritis is very frequent and

is often severe; the urine contains a large amount of albumin and casts of all varieties, but rarely blood. In a large proportion of the children under three years old bronchopuscumenta develops. Severe symptoms continue for from two days to a week; the patient may die from the sufden invasion of the largue, or there may be suppression of urine and uremic convulsions; but more frequently the cause of death is circulatory failure or bronchopuscumenta. Death usually occurs while the local disease is at its height. Occasionally it corses later from myocarditis after the signs of local improvement have begun. Evidences of myocarditis are present post mortem in nearly every case.

Those who manage to escape the dangers of the scate period have still others to executer. Among the latter may be mentioned, extensive slengthing in the throat or of the cellular tissue of the neck, which may be followed by severe or even fatal homorrhage, diffuse expparation of the same region, late nephritis, pneumonia, or pleurisy, and finally paralysis of the heart or respiration.

Complications and Sequelae.—Most of the complications of diplotheria have already been mentioned either under the head of Lexions or Symptoms. It only remains to consider their clinical association.

Otitis occurs particularly in the rhimspharyngeal cases, and is assectimes due to the diphtheria bacillus alone, but more often to mixed infection. The type of inflammation is often a severe one, and it may be accompanied by necrotic changes in the dram membrane which resemble those of scarlet fover.

Brombopneumonia is the most frequent complication in young children. It occurs especially in laryngual cases, and in those of a secure type whether the larynx is involved or not. Other polymonary complications are infrequent. Emphysema is a complication of laryngual diphtheria; it is nearly always vesicular, rarely interstitial. It may become general, extending into the collular tissue of the neck and afterward that of the entire body.

Pericarditis, endocarditis, and meningitis are all rare and are seen chiefly in septic cases of the most severe type. Myscarditis is much more frequent, and is present to a greater or less degree in nearly all severe cases. It moully causes no distinctive symptoms but can be detected by physical examination. Heart block has been described in the course of and following diphtheria, but is rarely permanent. It is to be referred to a lesion of the bundle of His.

Throndosis and embelism are smeng the less frequent complications. If cerebral, they may cause hemiplegia, aphasis, and semetimes recovalsions; if peripheral, they needly affect one of the lawer extremities, where they may cause endden pain, numbross, and coldness of the limb, followed by partial paralysis, edema, and sometimes even by gangrees. Thrombosis of the pulmonary artery or of the heart may be a cross of sublen Scath.

Henorrhages are usually massl, and while in most cases they are not serious, they may necessitate plugging of the posterior nares. Bleeding from any other mucous membrane may secure, but it is rare except from the month. Subcutaneous hemorrhages are infrequent, and are evidence of a very high degree of diphtheritic toxemia. They usually ever as small peterbial spots, but are sometimes extensive. They may be seen upon almost any part of the body, most frequently upon the abbreve and lower extremities; but the most extensive extravasation we have ever seen was in the neck, reaching from the clavide almost to the ear and covering nearly one lateral half of the neck.

Alternin is present in the urins of almost every case of moderate sensity, usually depending upon acute degeneration of the kidneys. Acute nephritis is most frequently seen in severe cases. It then usually develops at the height of the local disease, but may come during conralescence. Chronic nephritis very infrequently follows diphtheria.

Diarrhea is of frequent occurrence. There may be no intestinal besion or fleocelitis may be present, which, however, seldom goes on to ulceration. It is extremely rare that the membraneus form of ileocolitis is seen, and then it is associated with the presence of other organisms than the diphtheria bacillus.

Diphtheria is usually followed by a severe and often persistent assenia which may continue for weeks. Pneumonia, nephritis, and carding fiscuse may first abow thereselves during convalenceses, and so be ranked as separate. The most important sequel of diphtheria, however, is post-tiphtheritic paradrais, already discussed in the chapter on Multiple Neurona.

Pseumegastric Pseulgeis.—Some cases of diphtheria, especially those which receive no antitoxin or when the autitoxin is administered late or in too small amount, present a group of symptoms which have been referred to degeneration of the pseumogastric nerves. The evidence, however, is by no means conclusive that this is the true explanation of the clinical picture, which is a familiar one.

These symptoms may come on at any time in the course of the disease, but seldem earlier than the end of the second week. By this time the timut has usually cleared off entirely, and the patient is considered contalescent. The symptoms relate to the stomach, the heart, and the repiration. Usually the first thing in attract notice is that the patient refuses food and vomits occasionally, afterward persistently, without apparent cause. If the pulse is carefully observed it is found to be much stower than previously, being only 80 or 90 when it was formerly 170 or more. It is also weaker, compressible, and often somewhat irregular.

The face is pale or slightly symmetric, and moderate dyspical may be noticed. There are frequent attacks of severe abdominal pain which comes in paroxysms, and is usually referred to the epigastrium. These symptoms in most cases gradually increase in severity for two or three days, but sometimes develop with such intensity that death occurs within twelve or twenty-four hours. The later symptoms are a continuance of the abdominal pain and comitting; there is a feeling of great precorded oppression and distress accompanied by disposes; the respection is shallow and often rapid; the face is either pale or symmetric; the extremities, cold; the pulse, alow, irregular, and intermittent, becoming rapid on the slightest exertion. The heart sounds are weak, the most olar quality is absent, and the rhythm much disturbed. There may be no maximum. There is great reallesoness, but the mind is entirely clear. Death usually results from heart fashire, which may come quite suddenly, often from so slight exertion as turning over in bed or attempting to take foot.

Not all the cases are so severe. In the mibler forms there is seme pulpitation, an irregular pulse, slight dyspasse, and occasional synopal attacks, but of no great severity. Such symptoms may come and go for several days and then disappear; but more frequently they prove to be the beginning of the more serious form of the complication. The time of occurrence of these symptoms varies considerably. It may be as late as the third or fourth week. The late cases are generally associated with some other form of postdiphtheritic paralress.

Sudden heart failure may be seen late in diphtheria quite apart from the symptoms just described. It may occur with few or no premandary symptoms; as when a child falls dead after walking across a rosm, or suddenly sitting up in best, or from some other muscular effort, or posibly as a consequence of passion or excitement. We know of our little girl who was considered well amough to go coasting and who died suddenly after the effort.

The explanation of heart failure during or after diphtheria is therefore not always the same. When it occurs at the height of the disease it is satisfained due to cardine thrombosis, probably always associated with changes in the muscular walls. When it occurs late and follows some sudden muscular effort or excitement without premunitary symptoms of any seet, it is probably the result of changes in the muscular walls—a true myocarditis.

Biagnosis.—The diagnosis of diphtheria rests upon two kinds of evidence—clinical and bacteriological. In mild cases and in the ently stage only bacteriological evidence can be relied upon. However, the clinical manifestations of the disease are important and should not be ignored. It is in most cases possible to say from clinical symptoms that a case is one of diphtheria; but it is never possible to my from symptoms alone that a case is not one of diphthorm. Cultures, therefore, should, if possible, he made in every case. They are necessary in the mild cases in order that a correct diagnosis may be made and proper quantatine negatitions enforced.

The mere presence of diphtheria sacilli in the threat does not prove that a person has diphtheria any more than the presence of the preumocecus in his salira proves that he has pasemonia; but when diphtheria lucilli are associated with clinical evidences of inflammation of the threat or nose the diagnosis may be regarded as established. Again, the case may be one of diphtheria and the bacilli not found at the first examination, although found subsequently. In using antitaxin one must, in perhaps the majority of cases, be guided by clinical symptoms alone, not waiting for the result of the bacteriological examination. It is therefore important that both methods of diagnosis should be employed.

1. The Carriera Discussers.—Not much importance can be attached to the mode of onset; for diphtheria may begin in many different ways. The presence of a mosal discharge, especially if abundant, ichorous and tinged with blood, the early development of the symptoms of croup, and the rapid enlargement of the corrieral lymph nodes, all point strongly to diphtheria. Later symptoms which are especially diagnostic are marked anomia, progressive authoria, very feeble pulse which is sometime slow, sometimes rapid, sublen attacks of emorps, nosal negoritation from paralysis of the noseless of the throat, eye, or extremities, with paralysis of the heart or respiration.

The membrane of diphtheria generally appears first upon thy tousils, usually as a gray film which gradually becomes more dense and white, and often has the look of being plastered on. The color of older mem-brane is gray, greenish-yellow, brown, sometimes black. Beginning as a small patch, it sum covers the tensils. It frequently affects one tonal twenty-four or thirty-six kours before the other, and occasionally it is confined to one side. In exceptional cases it begins in the crypts of the touil and appears as isolated dots, which may confere to form a contimens patch like that already described, or it may remain isolated like the exidate of an ordinary followlar tonsillitis. More important is the fact that the membrane spreads from the original seat, and also the marner of its spreading. If it extends beyond the tonuls to the walls of the pharyne, the faucial pillars, and the usula, it is almost surely aphtheria. The same is true of doubtful patches on the tomils or fauces followed by symptoms of crosp. The rapidity of the spending varies much in the different cases, but the gradual extension, as shown by obserrations made at intervals of six or eight hours, usually settles the diagsais in the primary cases. However, if the throat symptoms complicate

measles or scarlet fever the above rules do not apply. Most of the membranous inflammations of the throat seen in these discuses are not due to diphtheria. This is particularly true of those which occur at the height of the primary discuse. Those which develop at a later period are often due to diphtheria.

Primary membranous inflammation of the largus may always be safely regarded as diphtheria; but if there is no stable membrane, the diagnosis is rendered positive only by a bacteriological examination. This may be true of many noval cases where the only symptoms are a discharge of the character previously described. Such cases may continue for weeks with no symptoms other than the discharge, especially in infants.

It is seldom difficult to distinguish diphtheria from other diseases; but the exudation upon the pluryux or tonsils may be confounded with thrush or ulceromembranous auguss. The appearance of the tensils on the second or third day after tensillatomy has been performed, may easily be mistaken for diphtheria by one who is unfamiliar with the appearance of the postoperative wound.

Diphtheria of the mouth may be mistaken for hypotic or ulcerative stomatitis; but, as a rule, it is seen only in the worst cases of pharynges! diphtheria. Diphtheria of the mouth alone is so rare that it may be

ignered.

It is sometimes difficult to distinguish cases of scarlet fever in which the threat symptoms are severe and appear early, from cases of primary diphtheria. In many of these cases the eruption appears late, and is not characteristic. Much importance is to be attached, as pointing toward scarlet fever, to a prevailing epidemic, a history of supcoses, a sudden onset with severe symptoms, romiting, prostration, very high temperature, and to a very active inflammation in the pharyex. In all cases with a sudden onset, in which from the threat symptoms one is inclined to make a diagnosis of diphtheria, the possibility of scarlet fever should not be forgotten, and one about never omit to examine the patient thoroughly for an eruption.

2. The Baccamotogican Dranvosis.—The Technic.—In many cases an immediate diagnosis may be reached by the examination of a coverglass smear from the throat. This method, although often calmible, is not adapted for general use, as bacilli directly from the throat are much less typical than those from cultures, and the chances of contamination are much increased. Furthermore, the month often contains other bacilli which somewhat resemble the diphtheria bacillus.

In taking a culture from the throat nothing but the membrane should be touched and this should be rubbed firmly with a swab, which is then rubbed over the surface of the culture-medium. In laryageal cases the culture should be taken from the posterior wall of the pharynx, and in again cases from the nestril.

The Relinace to be Piaced upon Bacteriological Diagnosis.—The diphtheria bacillus will almost invariably be found, if there is visible membrane in the pharynx, if no antiseptics have been applied shortly before using the swab, and if the culture has been made with sufficient care to good contamination.

The diphtherin bacillus sometimes disappears early; beare cultures made while the membrane is lossening may be negative. If the membrane has disappeared, or if none has been present, it is not infrequently accessary to obtain material from the tonsillar crypts in order to discover bacilli. It is therefore important in all cases to consider the disaption of the disease before drawing a conclusion from a negative culture. In cases of largugeal disease without pharyageal exudation, an early culture is negative in nearly half the cases; although a little later bacilli may be coughed up and found in the pharyax in abundance. A single negative culture should never be taken as conclusive.

For diagnostic purposes, all bacilli present in empirious throats, having the morphological and cultural characteristics of diphtheria bacilli, are to be regarded as tirulent.

Non-virulent Bacilli Recessibling the Diphtheria Bacillus.—There may be found in throats a form which corresponds in every other characteristic with the diphtheria bacillus, but which lacks similance, as shown by snimal tests. Also, another form, which, though in many particulars resembling the diphtheria bacillus, differs from it in being shorter, plumper, and more unaform in sore, and in producing an alkali in broth cultures; to this the term preside-diphtheria bacillus has been given. It is more frequently seen than the form just described and like it is non-tirulent. Both these forms are rare in throats where a suspicion of diphtheria exists.

The Presence of Virulent Bacilli in the Throats of Healthy Persons.

—That virulent bucilli may be harbored for an indefinite period in the firest or nose of a healthy person is proved by many observations. The New York Health Department made observations upon forty-right children in fourteen families in which one or more cases of dephtheris had occurred, and where no attempt at isolation had been made. In one-half these cases busilli were found, and animal tests showed them to be urulent in every one of six cases tosted, although four of the children did not develop diphtheria. Of the entire number, forty per cent subsequently developed diphtheria. Our own experience in two institutions where diphtheria has been endemic, fully confirms the observation that bacilli of all degrees of virulence are very frequently found in the noses or threats of exposed children, although a large proportion of them

never develop the disease. Outside of institutions and infected tensment houses, however, such a condition is much less common. Moss and Guthrie took cultures from 1.217 public school children in Baltimore. In (4 children diphtheria bacilli were found, but in only eight were they virulent.

Prognosis.—Many possibilities exist, and even the mildest case must be regarded as serious and carefully watched, since one can never know when unfavorable symptoms may develop.

The factors to be considered in the prognosis of any given case age: the age and previous condition of the patient; the ratent of the membrane and the rapidity with which it is specialing; the degree of aphtheritic toxonia as shown by the condition of the pulse and the nervous symptoms; whether or not the membrane has invaded the laryax; and the presence or absence of complications, especially rephritis and beanchoparaments; but of more importance than any or all these things in whether antibaxin is used and when it is administered.

The following figures are from the Report of the Health Department of Cheego of cases treated for a series of years.

				Died.		34.0	inte	6
Injecte	List day	355	149	1	-	0.27	teir	cent.
	2d day	L008		-07		1,60	*	*
	3d day			ST		3.77	*	
4	4th day		-	82	1000	11,39		+
	later				0000	25.37		
	Totals.	4,071		276		6.77		*

In all these cases the diagnosis of diphtheria was confirmed by cultures.

Diphtheria mortality is highest during the first two years of life, from its strong tendency to invade the larynx and lower air passages, and from the frequency with which bronchopneumonia scenes as a complication. Those whose experience with this discuse does not antedate the introduction of antitexin can scarcely appreciate the results previously obtained. Of eighty-fire consecutive cases under twenty-six morths of age observed in the New York Infant Asylum, in a period extending over two years, the mortality was sixty-eight per cent; in over two-thirds of the fatal cases the disease involved the larynx. In dipathera haspitals, where most of the mild cases included in the above statistics would peakably not have been admitted, the mortality in children under two years formerly varied from sixty to eighty per cent; in private practice it ranged for this age from thirty to sixty per cent.

It can not be too often emphasized that the danger from diphtheria is not over when the throat has cleared. The most frequent masses of death after this time are broachopmentmonia and cardiac paralysis. Prophylaxis.—In no infectious disease, smallpox alone excepted, can ar much be accomplished in the way of prevention as in diphtheria.

Public funerals of children dying from diphtheria should invariably be prohibited. Schools should be closed whenever the disease is epidemic. Children from families where diphtheria exists should not be allowed to attend school, nor mingle in any way with other children, for the reasons that they may, while healthy, be the curriers of the disease; and, what is even more important, that they may be themselves suffering from diphtheria in an early stage or in a mild form.

In every large city, hospitals for dightheria patients should be established, not only for the poor, but with private rooms for cases developing in hotels or other places where isolation is impossible. Every city should be provided with a steam disinfecting plant, where carpets, blunkets, bedding, etc., can be sent from the sick-room for disinfection.

Quarantian.—Not only every undoubted case of diphtheria, but every suspected case, should be immediately isolated. Quarantine for the latter should continue until the diagnosis is settled either by a bacterological examination or by the course of the discuss. Positive and suspected cases should not be isolated together. The quarantine in every instance must be complete. If possible, cultures should be taken from the throats of all exposed children. These containing diphtheria bacilli should be quarantined like cases of diphtheria, for they may be equally language; they should use gargles and aprays, and the nose and throat should be closely watched.

Bacteriology has furnished some very definite data from which the necessary duration of the period of quarantine may be determined. In this the physician is to be guided by the time that the bacilli remain in the throat, for the patient is to be considered as dangerous while they pensit. This point was investigated by the New York Health Department in 605 cases: In 204 of these the bueilli had disappeared by the third day after the membrane was gone; and in 101 they percisted for a longer time-in 176, for seven days; in 64, for twelve days; in 36, for fifteen days; in 12, for twenty-one days; in 4, for twenty-eight days; in t, for thirty-five days; and in 2, for acety-three days. In many of the cases in which the bacilli persist for an unusual time they are found deep in the crypts of the tomalls. Others are cases of assal diphtheria; it some of these doubtless the antrum has been incaded. While it is impositionably true that in a certain number of cases these persistent bailli are non-virulent, the opposite has been frequently shown. Of Il cases in which the virulence was tested, virulent bacilli were found in 9 at periods varying from eight to twenty-five days after the membrane WAS green,

Treatment of Suspected Cases. During an epidemic of diphtheria.

especially in an institution, every child with sore throat or racal discharge should be looked upon with suspicion, and isolated pending the result of a bacteriological examination even though no membrane is present. If there are patches on the tonsils or any other visible membrane, the case should be treated as true diphtheria, in order that no time may be lost. If the bacteriological examination shows the disease not to be true diphtheria, the patcent may be released from quarantine in two or three days, provided the throat symptoms disappear. It is, of course, important that the conditions laid down with reference to bacteriological diagnosis shall have been fulfilled. Should symptoms continue, however, a second culture should be taken.

Termunication of Persons Exposed.—When a case of diphtheria occurs in a family or an institution, every child and all adults should have their immunity determined by the Schick best. This is based upon the irritating action of unusulcalised diphtheria toxin upon tissues, when injected intracutaneously seen in the minute amount. The test therefore determines the presence or absence of nutural antitoxin, and indicates whether or not persons are susceptible to the discuss.

The New York Health Department applies an autifit for making this test.

Those persons with an immunity do not require antitoxin. Children who give a positive Schick reaction should be immunited. Adults who are not immune should be carefully observed. If they are to some in close contact with diphtheria patients they also should receive an immunizing dose of autocoin. When it is impossible to apply the Schick test, children under five years of age should be immunited with antitroin at once. With older children immunication may be postponed, provided only that they can be observed at least twice a day. If this can not be thoroughly done, all children under ten years of age should receive a prophylactic injection of antitoxin. Those older may be treated as adults are treated by close observation, but without antitoxin unless sere threat or other suspicious symptoms arise.

[&]quot;The method of applying the Schick test is as follows. With a file hypodermic needle and using a carefully graduated syringe 1/50 of a sciencian leshal dose for the games-pag, of diphtheris tests is rejected introduces only as I se 2 c. c. of salt solution.

If natural antitions is present no reaction occurs beyond that due to the small paneture. If no autitions is present a sircumeribed area of reduce, b) on in diameter, appears in reunity-four to forty-eight leave. This pension for six to be days and gradually dauppears, having a brownish pigmented spot that scales superficially, and that may be approached for months. There are no constitutional symptoms and no pain. The test is sharp and accurate. Occasionally a pseudo-craction may be seen. This appears cardier and disappears in 68 hours. The area is less sharply riseameershed and more inclumed.

The dose for immunication is from 500 to 1,000 units, the former long that required for an infant, and the latter for older children. There is no doubt that for a limited time—from two to three weaks almost complete protection is conferred.

Diphtheria so often complicates scarlet fover and measles, particularly in institutions and in hospitals for contagious diseases, that special emideration should be given to such patients. The Schick test should be made on all, and those patients with no natural immunity should be given antifexin. If the test can not be made, the only safe rule is to immunity every child admitted to a scarlet fever or measles haspital, and is institution epidemics of either of these diseases to immunity every shild attacked.

A nurse who is not immune to diphtheria should not work in infortion hospitals nor, ordinarily, care for diphtheria patients in private practice. If it is necessary for her to take care of a diphtheria patient the should receive 1,000 units of autitoxin. These general rules do not apply to physicians who are in less close contact with patients. They should take the same precautions as in scarlet fever.

The injection of a mixture of sexin and antitoxin in which the toxin is not completely neutralized is often used with animals to cause a production of antitoxin. Theobald Smith suggested such a mixture for the marranization of children and you Beliefug put it to the practical test. Becent observations by Park and Zingher have shown that this method not only increases greatly the amount of antitoxin present in the blood of immune persons, but causes the production of antitoxin in a large proportion of those who are susceptible to the disease. A combination of the mixture with a vaccine of killed diphtheria bucilli seems to be advantageous. The effect is not orident at issue, but after several we's an immunity can be demonstrated which has been proven to last for many months; how much longer it is as yet impossible to say. Party out of fifty susceptible persons in Park and Zingher's series dereligied an antiferric immunity. It is evident that a nature is thus offered of producing immunity in susceptible persons, which may be of great service, ast only for the individual, but one which can be employed to percent outbreaks of diphthoria in institutions in which children remain for a length of time. The method is not, however, applicable for use (string splifernies,

Treatment.—General Measures.—The directions to be carried out in the sixt-room have been outlined in the introductory pages on Infectious lineaue. It is important in every case of diphtheria that there should in plinty of fresh air in the room throughout the attack. Hospital relients should never have less than 1,000 cubic feet of air space, and if possible 1,000 should be allowed. Even in mild attacks the patient should be kept in bed throughout the entire illness, and in severe attacks this should be continued for some time during convalencence.

Nursing infants may be fed on broast-milk obtained by a broastpump, but should not be put to the mother's breast. These who are not nursed and older children should be fed very much as in other cases of severe illness. Milk is the main reliance; it should usually be diluted. The greatest difficulty in feeding is seen in the latter part of the diseas, when the patients are septic and have a strong aversion to food, when venting is easily excited and when scallowing is difficult on account of the swelling and pain. It is then that gavage is most valuable. In older children the tube may be passed through the nose.

Simulation—In most cases they are not needed until the third or fourth day, and in many they may not be required at all. The indications for stimulants are marked prestration, a feeles pulse, and a weak first sound of the heart. Of also held, half an ounce of whisky or brandy in twenty-four hours is enough for a child four years old. This should be diluted with at least eight parts of water. In very severe cases two or three times as much may be given; but more than this, except for a short period, is seldom wise. More reliance is to be placed upon the other circulatory atimalants, especially caffein, campber, and digitalls, which are given for the same indications as in other scate diseases or daring convalencement, morphin should be used hypodermically. Full down must be given and repeated every two to four hours, so that the child may be kept under its influence.

Except for stimulation or the control of special symptoms such as diarrhea, all internal medication should be omitted; for there is yet wanting proof that drugs influence the course or the result of the disease.

Local Treatment.—Since the introduction of antitoxin local treatment has become a matter of secondary importance; and under ceriftions when it can be carried out only with great difficulty and the use of force it is often wise too to attempt it regularly.

The purpose of local treatment, it is now generally agreed, should be obtained, and not the destruction of bacilli. Clembiness of the rese, month, and pharynx is important, innemuch as one of the chief diagree of the discuse is the aspiration of bacteria contained in the abundant secretions of these parts, into the larynx and broachi. Our aim should therefore be to keep the parts as clean as possible without too secreby taxing the strength of the child.

For cleaning the ness and pharyux only syringing can be depended upon. Nasal syringing is indicated when there is much nasal discharge, whether membrane is visible in the antirior narce or not. In septecase with a profuse fetid discharge it may be necessary to syringe the goe, no matter how strongly the shild resists. Whether it shall be done, will depend upon the condition of the patient's strength and his pulse. The purpose in syringing is not so much to clear the nose, from which absorption is slow and imperfect, as to flush the chinopharynx, from which absorption is always very active. Only bland solutions should be employed, such as a saline solution, one per cent, or a horicwil solution, one- to four-per-cent strength. For some cases, a piston springs may be need; but for most a fountain syringe possesses munfor advantages, and it is more convenient for hospital purposes. Irrigation of the pharynx is best done with the fountain syringe, and is of sepecial value where there is much swilling or abundant discharge. All solutions should be used as warm as can be borne, and in sufficient quantity to irrigate the parts thoroughly, a few such irrigations being much better than a great many partial ones. By a skillful norse syringing can in most cases be done with comparatively little disturbance to the thist.

Slight small hemorrhages may necessitate less frequent syringing, and a free hemorrhage may require it to be discontinued. Astringent solutions of alum and epimephrin are often beneficial in such cases, but my must be used carefully. In children who are ald enough gargles should be used. A solution of boric acid, or Dobell's or Seiler's solution much diluted, may be employed.

In cases with a moderate mosal discharge it is nearly sufficient to entage those or four times a day; but in severe septic cases, with very abundant discharge, syringing about the repeated as often as every two forms during the day and every four hours at night.

External applications have no effect upon the disease, but are often neful to pelieve pain and tension in the evollen lymph-glands. Poultiers should not be employed. As a continuous application, only cold is to be alread, generally by means of an ice-hag well protected to prevent wetting the clothing.

The treatment of cardiac and other forms of post-diphtheritic paralps has been considered in the chapter on Multiple Neuritis.

The Scram Treatment.—Antitoxin is produced by the cells of the body under the stimulus of the diphtheria toxin. It is intimately combined with the globulin of the blood, and is itself peopley a globulin. It sixetly neutralizes the toxin produced by the diphtheria hacillus, and the has some effect upon the bacilli themselves, the nature of which is not understood. It induces a condition in the blood which inhibits the powth of the bacilli, and thus arrests the membranous inflammation which they excite.

Preparly prepared, it will keep without deterioration for from three

to six months; but after one year it loses somewhat its unitionic properties. It should be kept in a cool, dark place, and after a buttle has been opened it should be used within a few days. Antitoxin to near prepared in a dry form, which is to be preferred only when it must be local for a very long times.

The strength of the serum is measured in antitoxin units, the unit being an arbitrary one, viz., the amount of antitoxin which will protect a genera-pig weighing 250 to 200 grams against one hundred times the fatal does of diphtheria toxin. Behring's serum first used contained but one unit in each e. c. At present there can be obtained sera containing \$1,000 antitoxin units or more in each e.e. This concentration is of immense advantage and has to a large degree done away with the upplement symptoms.

Method of Administration and Dossge.—The skin should be theroughly element with alcohol; the needle should invariably be boiled and the whole syringe either boiled or rinsed with alcohol. The sent of injection is not a matter of great importance; our own preference is far the cellular tieste of the abdomen or axilla or the nuncles of the butteck. Absorption from the cellular tissue is slower than from the nuncles. For very uspid effect, however, intravenous injections should be employed. After the injection is made the puncture should be covered by adhesive plaster.

The union of the texis with the cells takes place rapidly. To prevent
this the maximum required does should be given early in a single injection, rather than in divided does. While the deleterious effect of the
texis bound to the cells can not be neutralized except to a slight exist,
the blood can be supplied with sufficient antitexis to neutralize new toois
as fast as it is produced. Convinced now of the essential harmlessness
of the serum, the tendency everywhere has been to use larger and larger
does. For a child over two pears old an initial dose for a severe attack,
including all largngest cases, should not be less than 7,000 or 8,000 units
siministered intramuscularly or preferably intravenously. Children
under two years should receive from 5,000 to 6,000 units. Cases of
exceptional severity, in adder children, should receive from 19,000 to
15,000 units intravenously. Mild cases should receive from 3,000 to
5,000 units, a repetition of the does in any patient being usually unnecessary.

In cases receiving antitoxin late, even though the symptoms may not seem particularly severe, the dose should be increased in proporties to the length of the illness, and given intravenously. Only serum from a trustworthy manufacturer should ever to used. The most concentrated serum which can be obtained should be selected.

All experience shows that the results are greatly modified by the

time of its administration. The scrum can not undo the serious damage already done to the cells of the body, and this at the time of injection may be an great that death will result. In very mild cases, with older children, one may wait for the result of a bucteriological examination, lat pover in a severe case and never in a young child. In the group of grees cases should be placed every one which at the first visit shows a pharyngeal exudate covering more than the toneds, also all cases with emptans of laryngeal invasion, and all with an expitate on the pharynx. and a profuse mosal discharge. If in a doubtful case twolve hours' observation shows that the membrane has spread from its original seat, no further delay is admissible. In human diglotheria marked benefit usually follows injections made as late as the third day; but after this time the raise of the serum diminishes very rapidly, and although striking examples of Isnefit are sometimes seen after later injections, they can not he depended upon. In very severe or in malignant cases so much harm may be done during the first twenty-four hours of the attack that the inbequent use of antitoxin is without avail-

The effect upon the diphtheritic mandrene is usually noticeable within beenty-four and often in twelve hours; it first stops sprending, sed soon begins to soften and loosen. The swelling of the mucous membraze subsides and the local disease abutes, very much as when the disuse runs its usual course. The striking thing after the use of antitoxin is the rapidity with which these changes take place, and the abrupt tranation from an advancing to a retrograde process. The subsidence of the inflammatory conditions in the laryux and traches is quite as marked as in the pharynx. The symptoms of stenosis, even when severe, often Smirish in a few hours, making operation unnecessary in a very large number of eases when previously it seemed inevitable. The membrane bosens rapidly in the larvax and tracken, sometimes necessitating the Inquest removal of the intulation take, when operation has been performed. Improvement is also shown by the constition of the usual discharge, the re-establishment of mosal requiration, and the diminution in = welling of the glands of the neck.

The effect upon the constitutional symptoms is not less striking. In Investile cases there is even, offer in twelve hours, a fall in temperature and improvement in the pulse and in the nervous symptoms.

The Limitations of Antitoxin.—It is important that these should always be kept in mind. The serum must be given early, for if given late it can not undo the mischief already done by the diphtheria toxin.

Case of great severity have often passed the period when recovery was possible, before the antitoxin is given. This period may in some cases be four days, in others it may be less than twenty-four hours. The tissues must enceptible to the diphtheria toxin are probably those of the nervous

system, the heart, and the kidneys; and the consequences of its action may be seen in the production of nephritis, in heart failure at the height of the discuss, or in later paralysis of the heart, respiration, or the voluntary massles, in spite of the fact that antitoxin is given at a period early smough to avert death from local disease in the largus or beauti. Against the phlogmonous inflammation of the throat or the collidar those of the nock, bronchoparamonia, and nephritis, antitious is powerless; and just in proportion to the severity of those inflammations are negative results seen.

Ecuptions and Other Unpleasant Effects.-Some transcent, local edema neually follows the injection and a slight rise of temperature is very frequently abserved. In a few hours there may be seen a general erythema; this, however, is mre and usually of short duration. The most important eraptions are seen between the eighth and fourierally days. They follow from five to ten per cent of the injectious made, and appear to be quite independent of the amount of serum used. The exact came is not known. The most common eruption is urthuria. This is often intense, very annoying, and may nearly easer the body. It may te accompanied by a slight rise of temperature; it usually lasts for two or three days; but is rarely severe for more than twenty-four hours, Various forms of crythema are accasionally met with. In several instances we have seen hemorrhagic emptions, generally in the neighborhad of the large joints, and always in children suffering from extrema malnutrition. In a few cases a moderate swelling of some of the joints has been observed, and a transient albuminuria. One occasionally mets with patients who seem unusually susceptible to serum injections, and in whom even small imprimizing doses came houtsche, mucular pains, and general malaise, so that they feel quite wretched for several days, All of the above symptoms except the urticaria are zure, and should not for an instant deter one from using antitoxin when indicated. They are much less common with the refined and concentrated antitotin in use at the present time.

Real and Alloyed Dangers from Antitoria Injectious.—In a few instances sudden death has followed antitoxin injectious, but the evidence that antitexin was the cause of death has not always been consimpe. In some of these patients the autopey has revealed a status lympinious not before suspected. In this condition the shock of so slight a thing as a needle puncture may produce death. There are other cases which do not admit of this explanation. Almost all have occurred in patients during addressence or shall life. The symptoms usually come on within a few seconds or minutes after the injection and occur quite independently of the dose given. Several have followed small immunizing does given to apparently healthy persons, but the majority have been sufferen from key fever or asthma, usually from that form excited by contact with horses. In some recented cases the patients had received antition before; in the great majority, however, the sensitiveness to the protain of horse serum had been acquired in some other way. The most striking symptoms are a rapidly developing dyspasa with syanosis and great postration. In the most severe cases death may follow in a few minutes from respiratory failure; in these less severe, a gradual recovery takes place with no permanent after effects.

Such experiences are, fortunately, exceedingly rare. No fatalities or rus severe respiratory symptoms due to the administration of antitoxin have been observed since its introduction in the Willard Parker Hospital is New York where many thousands of injections of autitoxin are given such year. Certainly in children with diphtheria one should not heafate me moment in regard to its use. If the patient gives a history of authms, and inquiry should always be made regarding this, special precautions should be employed in giving antitoxin. As concentrated a preparation as possible should be used and injected subestaneously a drop or two at a fine, at intercals of ten or lifteen minutes. If there is no reaction after the first few drops the rest may be injected at once. If there is any reaction it will not be severe and after a time a drop or two more may be giver. Thus the whole dose may be given, though it may require much time With a clear history of asthma, injections for immunication may well be omitted and the child kept under close observation. If symptoms Arrelog after the injection of serum, atropin should be given in full doses; episephrin and morphin are also useful. In some instances artificial popiration has apparently been beneficial.

Results with Antiform Treatment.—Since 1895 the serum has been tested on such an extensive scale as the provalence of diphtheria all over the world has made possible, with results so uniformly good that it seems quite unnecessary any longer to site statistics in proof of the value of this benely.

The beneficial effects of antitoxin may be summed up in the following statements: (1) The percentage negrality from dipletheria in hospitals both in Europe and in America has been reduced to a little more than one-third the previous figures; (2) the proportion of cases now requiring operation for laryngeal stenous has been reduced to about modalf; (3) the mortality after trachestomy has been reduced to onehalf, and that after intulation to about one-third the former figures; (4) but even more convincing is the effect of the serum treatment upon the actual diphtheria mortality of cities and countries where it has been used.

Correlements.—After a severe attack of diphtheria convalenvace is always slow on account of the anemia and the depressing effects of the

disease. Patients should invariably be kept in bed for at least a week after the threat has cleared, and much longer if any tendency to rardiac weakness is seen. The pulse should be carefully watched, and irregularity, intermission, discretism, or a weak first sound of the beart, should make one apprehensive. An abnormally slow pulse is generally more serious than one which is rapid. In such circumstances the putient should be kept recumient and absolutely quiet, since fatal syncope may be the result of a violation of these rules. The extreme degree of anemia frequently requires that iron be given for a considerable time during convalescence.

Great difficulty is occasionally experienced in getting rid of the tecilli in the threat. The tomillar crypts, the adenoid tissue of the rhinoplaryna, and the meal sinuses are the places where the becilli are most likely to remain. Inasmuch as it is now generally made a condition of release from quanatine that the throat shall have been shown by cultures to be free from barilli, this becomes a matter of much importance. Natal syringing with a very weak solution (1-10,000) of bicklorid to which ben per cent solution of glaverin has been added is sometimes efficacious. The fluid should be warm and the syringing gently done twice daily. The same solution may be used as a gargle. For children under four years old a simple salt solution, or a dilute Dabell's solution, should be substituted and the gargle omitted. In some obstimute cases the lest procedure is to omit all local treatment and get the patient into the open air of the country. When bacilli are very putsistent, as they often are for weeks, their virulence should be tested. In the great majority of such cases they are found to be non-virulent and further quarantine is unnecessary. When virulent bacilli long persist, the question of the removal of the toroils should be considered. It is sometimes successful when all other means of getting rid of the bacilli have failed.

Largugeal Diphtheria.—Emetics, inhalations of steam, and solvents ' for the membrane, although they all sometimes give relief, are not to be relied upon.

Opinions will always differ as to the time when operative interference is called for. One should never wait for general symmetric often this does not occur until just before death. It is better to operate too early than too late. If, in spote of other measures, the dyspica increases steadily, operation should not be deferred longer. Intubation has almost universally superseded trachestomy as a primary operation for the relief of membraneous laryngitis. Typehectomy is still needed at times for the cases, for in number, in which intubation fails to give relief on account of the position of the membrane or for some other complication.

Intubation

Intubation is the introduction of a tabe through the mouth into the largus for the relief of larguageal dyspuss. For the operation, as now performed, the world is indebted to the late Dr. Joseph O'Dwyer, of New York.

A set of O'Dayer's instruments consists of seven takes, an introductor, an extractor, a meeth-gag, and a gauge. The tubes are made of
hard rubber and lined with gold-plated metal. So carefully did O'Dayer
perfect his instruments that nothing of importance has been added by
others. It is interesting to note that nearly all the modifications which
take been suggested since his first publication had already been tried
by him and discarded. No one thing is more essential to success with
intulation than properly constructed instruments. The operation is
not difficult if one has had practice on the cadaver. Without this it
should not be attempted. The tube is selected according to the age of
the putient, this being indicated on the gauge. A very large child will
often require a tube of larger size than his age would call for.

Introduction of the Tube.-Either one of two positions may be employed, the choice depending upon the preference of the operator, In one the child is seated upon the lap of a nume while his head is stradied by a second assistant standing behind. In the other position the shild liss upon his back upon a table, his head being steaded by an swistant. In both positions the arms should be pinioned to the sides by a diret. In the recumbent position the child can be held more firmly; it has also the advantage of dispensing with one assistant, and in an emergency with both of them. The tube is attached to the introductor, and the gag is inserted at the left angle of the mouth and opened as widely as possible. The attempts at introduction must be made quickly, for during them respiration is peactically arrested. Several short attempts are always better than a single prolonged one. Very little force a ordinardy required in introducing the tube, that used in passing a estheter being a good general guide. In cases of subplottic stenosis, lawrer, quite a little facce may be necessary.

The index finger of the left hand is used as a guide in introduction. This is passed well back into the pharynx, then brought forward until a hard nodale—the upper border of the cricoid cartilage—is encountered. This is the best of all landmarks, since the soft parts are often distorted by exciling. Directly in front of the cricoid cartilage may be felt the apiglottis and the opening of the largux, which are readily recognized after the tauch has become somewhat educated. The apiglottis is drawn forward and the tube is passed along the palmar surface of the left index larger, by which it is guided into the largux; it is then pushed off the

introductor by a thumb-piece attached to its handle. When it is certain that the tube is in position, and the patient breather properly, the loop of silk attached to the head of the tube is out off and pailed through the removal of the tube being prevented by placing the left foreinger upon its head. The silk is not usually left attached unless there is evidence of looss numbrane below the tube. It may be desirable to burs the silk attached in case no one is within reach who is able to remove the tube should it become obstructed. The child's arms and hands should then he secured to precent him from seizing it himself. When not gomoved, the silk is fastened to the check by a piece of adhesive plaster. The tube is known to be in place, first, by the hissing breathing sounds, somewhat similar to what is heard when the tracken is opened; secondly, by a severe paroxysm of coughing, which is usually excited by a tube in the larvax; thirdly, by the relief of the dyspnes. If this relief is not very apparent the physician may still be in doubt as to whether the tube is in the larvax or the esoplagus. If in the former, it can not be pushed down by the finger without depressing the larger with it; and by introducing the fuger into the pharynx, the posterior wall of the largus can be felt between the finger and the tabe. The most common mistake made is to pass the tube into the esophagus. This sometimes happens because the position of the child's head is improper-too far forward or too far backward-but more often because the operator has not been quite oure of his landmarks. If this has occurred, there is no relief to the dyspner, no hissing sound, and the tube can be pushed down indefinitely. When this condition is recognized, the tube is withdrawn by the loop of silk and after a few moments a second attempt made.

False passages in the laryax are most frequently made by employing too much force or because the operator has worked at the angle of the mouth instead of keeping in the median line. The take usually goes into one of the ventricles of the laryax and may be pushed quite through the laryax into the cellular tierne. This is not very likely to happen, however, unless undue force has been used. The production of a false passage is recognized by the fact that, although the tip of the tube can be felt to enter the laryax, the tube does not descend, but projects alway the epiglottis.

False membrane which has become bosoned is sometimes crowled down by the fabe and obstructs the larynx just below it. This is one of the most serious accidents that may occur, but fortunately it is not a frequent one. It is more likely to happen when the discuse has existed for several days than in recent cases. The tube may be in place in the larynx as shown by all the signs above mentioned, except relief of the dyspnea. In such a case the immediate withdrawal of the tube is necessary, it being often followed for the discharge of masses of lasse metter trans. This is aided by the administration of half a tenspoonful of pure which or brandy to excite a strong cough. Artificial respiration may be required, and if there is no relief by any of these means trachestomy is indicated. Asphyxia is sometimes produced by prolonged and injudicious attempts at intubation.

After-treatment.—So far as the tube itself is concerned no treatpaint is required. The original disease is to be treated as before. The operation has removed only one danger from the patient, viz., that of asphysia from mechanical obstruction of the largus. A good expulsive rough should occur after the tube is in place. This is necessary to clear the tube of mucus, as the pharyux and largus are generally filled with it as a result of the manipulation.

The child should not be allowed to lie upon his face, nor should be be held over the nurse's shoulder face downward, for in either position a slight cough is enough to expel the tube. Nursing infants may sometimes continue at the broast after the operation; ordinarily they have but little difficulty in avallowing. Older children often experience considerable trouble in taking liquids. This may be overcome by the device sugpated by Casselberry, of having the patient's head lower than his body while he drinks. When fluids cause excessive coughing, or at other times when they can be taken only with the greatest difficulty, they may be given through a nasal tube or one passed through the mouth. Seni-selid articles, such as condensed milk, wine jelly, cornstarch, ice erom, or scrambled ergs, may be well taken when finide are not. Feeding is always easier after the first day or two, and patients who war a tube for chronic disease soon experience no trouble whatever, showing that the difficulty depends more upon the installity to coerdinate the movements of the muscles of deglotation when the tabe is in place than upon mechanical causes, for the head of the tube is effeetually covered by the epiglottia.

When the tube is removed by extulation or coughed up, the dyspnea does not usually return for two or three hours, but may come back at once. It may happen that the tube is coughed up and not seen by the nurse, or it may be coughed up and swallowed by the child. When called because of dyspnea after operation, the physician should make a digital examination of the pharyux to discover if the tube is still in place. Swallowing the tube generally causes no harm to the child, for tubes have repeatedly passed through the intestines. Should the tube be coughed out at any time its introduction should be delayed until dyspnea returns.

It sometimes happens that the tube is coughed out soon after its introduction because too small a size has been need. At other times this seems repeatedly even with tubes of the proper size. Such cases are probably due to paralysis of the laryngeal muscles. As patients in each curcumstances are unable to breathe for even a few minutes without the tube it is usually necessary with repeated self extulation to perform trackedsomy.

The entrance of food into the brought through the tube is a danger that does not exist, and broughopneumonia following intubation does

not depend upon this cause.

Deep afceration at the head of the tube rarely occurs, provided properly made tubes are employed, but superficial afceration is almost invariably produced at the base of the epiglottis and in the trackes at the lower end of the tube. Deep afcers extending to the tracked rings may occur in ill-conditioned children, usually in connection with other complications serious enough to cause death.

Spentaneous descent of the tube into the laryax is almost impossible, and it can not be crowded down without using considerable force and

severely lacerating the largest.

Sudden blocking of the lower end of the tube by membrane bossned from the tracken or bronchi occasionally socurs. The must result of this is the immediate expulsion of the tube by coughing, the discharge of the losse membrane following. This condition is one of the safety values of the operation. One of the strong points in favor of intubation is that the foreible cough which the patient is able to make an account of the narrow opening of the tube, often enables him to expel large accumulations of mucus, and seen membrane, more readily than through a much larger tracked opening.

The period for which the tube is required varies much in different cases. It has been materially electened by the use of antitoxin. The average time of wearing the tube is about five days, and in many it can be dispensed with in two or three days. An attempt should be made to have the child go without the tube whenever the temperature reaches tormal. If complications are present that still cause fever extubation should not be deferred beyond the fifth or sixth day. The majority of cases do not require re-intuluation. If this is necessary, extubation should be done again in three or four days and repeated thereafter at this internal until the tube is no longer necessary. If, after several weeks the tube cannot be dispensed with the treatment described later for refinized intulation tubes should be adopted.

Removal of the Tube—Extubation.—This is rather more difficult than its introduction. The general arrangement of the patient and assistants is the same as for introduction. The left index finger is placed upon the head of the tube, which is steaded externally by the thumb of the same hand. The beak of the extractor is introduced within the opening of the tube, its javes are then separated by pressure upon the lever at the handle, and the instrument withdrawn, very slight force being

required.

The tute is first removed tentatively, the physician uniting to see if dyspues returns. It is well to give a full dose of morphin an bour before the removal of the tube, since this operation is almost invariably followed by a marked degree of laryngeal spasm which lasts for ten or lifteen minutes. To avoid the production of counting and the entrance of food into the larynx, food should not be given for three hours previously. If dyspues does not return in the course of three or four hours, the probabilities are that the tube will no longer be required. It is exceptional that the patient has great difficulty in dispensing with the tube, as so often happens after trachectomy.

The only objection of much force arged against intribution is that asphysia may be produced by crowding down loose membrane into the larger. This is an infrequent accident; should it happen, and the asphysia not he relieved by removing the tube and inserting another,

transpotency may be performed,

There is always some degree of hourseness following intuhation, but in the majority of cases it disappears within a week, occasionally it continues as long as three or four weeks, but it is very rarely if ever permanent. The duration of the aphonia occurs to have little relation to the length of time the tule is worn, unless this is many weeks.

Experience has alearly proved that intrination relieves the dysposes due to larguiged atenous promptly, efficiently, and certainly; it does this without many of the dangers and objectionable features of trackcotomy, while at the same time it does not deprive the patient of any essential

advantage which trachestomy affords.

Retained Intubation Tubes-Prolonged Intubation.-Difficulty is experienced in dispensing with the intulation tube much less frequently than with the cannula after trackeotomy; yet when this condition occurs it is the same of much concern and even danger. Trouble of this sort is seen in about five per cent of the cases of intubation. In the majority of these the putient is able to do without the tule in a few weeks, and each cases require very close attention, but no special treatment other than the substitution at times of a special O'Dwyer take with an extralarge "retaining swell." But occasionally there are met with cases in which every effort to dispense with the tube proves futile. Although the children breathe well with the tube in place, still if it is removed or expelled by coughing, in a short time, varying from a few minutes to several days, the dyspuea returns with such severity that the tube must be replaced to prevent asphysia. Inastruch as these patients sometimes supil the tabe several times a day, surgeous have often reserted to trackecours to avert the danger of suffication, which might easily occur if no

one were at hand who could replace the tube. This operation, however, gives only temperary relief. Many of these children, after wearing tubes of one sort or another for years, ultimately die from some accident connected with the tube or from pneumonia.

The causes and the exact pathological condition underlying this difficulty are subjects regarding which there has been much difference of opinion. The cause of the returning dyspace is probably subglottic swelling and adenta which occur in tissues which are the seat of chronic inflammation, as seen as the pressure of the tube is removed. In a few cases a cicutricial condition, the result of previous alternation, has been found; but it is doubtful if granulations, so frequent a cause of related cannots after trachectomy, play an important part. The chronic inflammation of the murous and enhancement issues of the subglottic region of the larynx which produces the symptoms, is aggressed by a faulty tube or a clumsy operation, but it may occur under the most favorable conditions.

For the relief of this condition, O'Dwyer advised in recent cases the application of astringents by means of an intubation tube reated with gelatine with which some astringent was combined. For these patients who rough out the tube frequently, trackectomy is at times a necessity to prevent sudden death. But this does not affect the original condition, for the same difficulty exists in doing without the tracked cannula. The operations of laryngotomy, curetting, etc., have been such signal failures as to discourage one from repeating them.

The most successful method of treatment thus far proposed is that of Rogers, which consists in increasing intra-laryngeal pressure by the insertion of larger and larger intubation tubes. This is not to be adepted until long after all neute symptoms have subsided. The first tube used is as large a one as can be introduced without force; after a few weeks, the next larger size, and after a larger interval, possibly a still larger one. When the very large trile has been worn for several weeks one is usually alde to dispense with all tubes.

True cicetricial stenosis may best be relieved by opening the traches and dilating from below, and afterward inserting an intubation tabe. When there is complete destruction of the cricoid cartilage, as sometimes occurs, trachestomy is the only remedy, but this is only pullistive, as the tube must be worn permanently.

CHAPTER IX

TYPHOID PEVER

Tyrimm rever is an acute infectious disease due to a specific organism—Eberth's bacillus. It may affect the fetus in afrec, or the newlyborn child, and it is seen in infancy and throughout childhood.

Peratyphoid.—This is a disease in all respects similar to typhoid fever and ane that cannot be differentiated from it except by bacteriological esamination. It may be due to organisms known as paratyphoid "A" and paratyphoid "B." This disease is much less common than true typhoid, but small spolemies from time to time appear. These are usually due to paratyphoid "B" which, in this country at least, is much nace common than paratyphoid "A." There are no clear distinguishing festures between them. Widal reactions in these infections and in true typhoid suncethat overlap one another; but they may, in certain instances, he fairly distinct so that from the Widal alone the diagnosis can be suspected. Not many autoposes have been reported after infection with these organisms; but in general the lesions do not differ markedly from three of true typhoid.

Fetal Typhoid.—When a pregnant woman develops typhoid fever, infection of the child in attro is a frequent but not an invariable occurtence. The fetal form of the disease is a general blood-infection, since the intestines are not functionally active. The most common result is death of the fetus and consequent abortion; but the child may be been slive still suffering from the infection. On account of the infant's feeble resistance death usually accurs.

Infantile Typhoid.—Molern methods of diagnosis, particularly blood cultures, have answered the question, long discussed, as to the frequency of infantile typhood. It is a relatively rare disease. In over 14,000 admissions to the Babics' Hospital, New York, covering a period of distreen years, but eleven cases of typhood were observed under two years of age and but five cases of our year or under, the youngest case observed being in a child eight menths old. In Philadelphia, where more has been much more typhood generally than in New York, Griffith reports under his personal observation or in the Children's Hospital buty-five cases under two years and nine under one year; his youngest mass were aged three, five, and nine menths respectively. Typhoid has been seen by Murchisum at six months and by Ogle at four and a half menths, the diagnosis being, in both instances, confirmed by autopsy. It is during epidemics that most of the infantile cases are seen, but even in epidemics it is surprising that so few infants are attacked.

Typical in children is by no means rare, but it is not until after the fifth year that it can be said to occur frequently. The following figures, embracing groups of cases reported by eight writers, represent the relative frequency with which the disease is seen at the different ages: 01 970 cases, eight per sent occurred under five years, forty-two per sent between five and ten years, and fifty per cent between ten and lifteen years.

Typhoid fever is almost invariably contracted by drinking water or milk which contains the germs of the disease. The infrequency of typhoid even in infants who are artificially fed is explained, in part at least, by the fact that most of the water and a large part of the row's milk taken have been previously beiled, or heated in some numer.

Lesions.- In a general way these resemble those of adults except in severity. In a considerable number of the cases the puthological process in the intestines does not go on to ulceration; and when alcors form they are seldom large or deep, and perforation is very rare. Montmollin gives the following facts concerning twenty-three autopoies, most of them, however, being in children over eight years old; ulcurs were present in seventeen cases; they were situated in the lower ileum in sixteen, and in ten they were only there; in the ascending colon in nine, and only there in one case; perforation occurred in three cases, in every instance in the lower ficum. Autopoles made upon infants may show even less severe intestinal losions flun floss mentioned. In fact, some cases in which the clinical diagnosis was beyond question, have shown only moderate redness and swelling of Peyer's pairlies, the solitary follicles and the mounteric lymph nodes-lesions which are exceedingly frequent in cases of simple diarrhen. In a doubtful case such post mortem findings do not establish the diagnosis of typhoid. Indeed, they prove nothing unless sultures from the intestinal contents, the mesenteric glands, or other seguns, show the typheid bacillus. Enlargement of the spleen is practically constant. The degenerative charges in the heart, the kidneys, and the liver are much less frequent and generally less severe than in whilts.

Symptoms.—The peculiar features of typhoid in early life are some only in children under ten years old; for after this time the disease does not differ cosmically from the adult type. In brief, the typhoid of early childhood may be described as a fever characterized more often by nextens symptoms than by intestinal symptoms.

Oncel.—A sudden onset with well-marked symptoms—fever, perstration, veniting, etc.—is not uncommon; in fact, it is more frequently seen than the incidious beginning, with lassitude, headarhe, contel tengue, anoronia, and gradual rise in temperature. In cases developing abruptly it often appears as if an acute indigestion had been the means of precepitating the attack. The most frequent initial symptoms are

comiting, diarrhea, prostration, bendache, anorexia, and fever. Chills are rare; occasionally there is abdominal pain or tenderness. Epistaxia occurs as an early symptom much less frequently than in adults.

Condition of the Bowels.—There is no constant relation between the secrity of the intestinal lesions and the condition of the bowels. Taking large groups of cases together, diarrhea is present in only about half the total number. It is rarely profuse, from two to four discharges a day being the average. The appearance of the stools is seldom characteristic; they are usually thin and fluid, often containing mucus. Constipation may be present at the beginning only, or throughout the attack. Tympanites is generally moderate, and is often entirely about; it usually accompanies constipation. Marked iliac tenderness and gargling are infrequent.

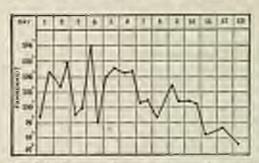
Spleas.—By the end of the first week this is usually found to be enlarged to a sufficient degree to be recognized by pulpation. In most cases it extends but an inch ar an inch and a half below the ribs, but at times it may be three inches or more; persistent enlargement may indicate that the discuss is not at an end even though the temperature has reached the normal, and a relapse should be expected.

Bruption.—It is the experience of nearly all who have seen much of typhaid in children that the eruption is less constant, usually less abundant, and less characteristic than in abults, but appears rather earlier. We have, however, seen it so abundant as to suggest measles. The typical eruption consists of small, scattered, rose-colored spots, which appear chirdly or solely upon the abdomen at the beginning of the second week. They come in successive crops, each one of which generally lasts three days, the whole duration of the eruption being about ten days.

Prastration, Emeriation, etc.—As a rule the prostration is quite sufficient to keep a child in hed after the first few days. The general weakness after this time is in direct proportion to the height of the temperature. Loss of fiesh is steady and usually marked; and in a prolonged attack there may be emaciation.

Temperature.—In the cases with a gradual onset, the typical temperature curve is one which rises steadily for from two to seven days, factuates within the limits of one to three degrees during the second week, and steadily declines during the third week, reaching the normal on the average at the end of the third week. In cases with an abrupt case, the temperature rises at once to from 102.5" to 105" F., but subsequently may run the same course as in the first group.

The following are the most important variations from the temperature curve of adults: the initial rise is much more frequently rapid; during the second week the remittent character is less marked; the average duration is shorter. In young children the proportion of cases in which the forer lasts only from eight to fourteen days is quite large (Fig. 171). After the age of ten years the type of the fever is much like that seen in adults. The maximum temperature in the mili cases is 103° or 104° F.; in the severe ones it often reaches 105° or 106° F.



Pro. 171.—Trupped Ferral or Smoot Demarted as a Carta Tenerous Masses One. Spless sularged; eraption typical; no distribut and only moderate abduminal distribution. There were two other cases in the family, all being due to the same cause—interest milk. (After Northrap.)

but rarely goes above this point. The range is usually higher than in adult cases of the same seventy. At the beginning of convalessence a subnormal temperatune in very frequent, and by many writers is considared to be the rule. A secendary rise is most frequently due to errors in diet, but may occur from the development of complientions. A sudden fall often indicates either perforation or intestinal hemorrhage.

Belapses occur in approximately 10 per cent of the cases. They follow about the same course as in adults (Fig. 172).

Nervous Symptoms.—In many cases these are more prominent in severe cases than the intestinal symptoms, and are directly perportionals to the height of the temperature. The extreme nervous symptoms belong-



Fig. 172.—Treason Favon were Relater. Child two and a half years old; early temperature high and symptoms typical; natural full on fourteenth day, size on seven teach day apparently due to suble; relapse on twenty-fourth day, with feeth expense and secure of opionic swelling which had disappeared. Temperature was mis normal at the end both of primary and secondary fever.

ing to the typhoid state in adults are rare in childhood, except in putients ever ten years old. Headache and mild delirium at night are very frequent, the former being seen in the majority of cases. Young children are usually dull, apathetic, and often in a state of semi-atupor. Occasionally the disease may closely simulate meningitis. The nerveus symptoms are usually most severe in the second, or early in the third work, and subside as the temperature declines, but may continue for several days thereafter. Essaggerated reflexes and ankle closus are not infrequent and may persist well on into convalescence in severe cases.

Palse.—This is increased in frequency, but not to the degree that is seen in most discuss of childhood with a similar elevation of temperature. The force and rhythm of the pulse are usually good, irregularity and discussion being care in children as compared with adults.

Urise.—A small amount of albumin is found in the urine of most of the severe cases at the height of the disease, and is due to acute renal degeneration; but a marked degree of nephritis is infrequent. In from ansfourth to one-third of the cases typhoid bacilli are found in the urine, generally in pure culture. They usually appear in the latter part of the disease, the second or third week, and may continue for months or even years. They are sometimes accompanied by evidence of cystitis or nephritis. Their number is in some cases so large as to render the urine turbid; in others they give no indication of their presence. Ehrlish's diago reaction is usually present at the height of the fever.

Blood.—The characteristic blood picture in typhoid is a low leucocyte count, generally under 10,000, accompanied usually by a slightly increased properties of lymphocytes. Blood cultures, with great miformity, show the facilitiesen in the first week of the disease. These usually have dis-

appeared from the blood by the third week.

Intestised Hemorrhage.—Of 946 collected cases, mainly from hospitals reports, intestinal homorrhage occurred in thirty, or about three per cent; the majority of these were in children over ten years old. Of twenty-four collected cases of homorrhage in children, ten terminated fatally. The youngest case of this nature which has come under our own notice was in a child of four and a half years.

Intestinal Perforation.—This is even more rare than homorrhage. In L028 collected cases, this accident occurred but twelve times, or in 1.1 per cent. Perforation is indicated by a sudden fall in the temperature, with collapse; usually there is vomiting and the rapid development of temperature with leurocytosis.

Complications and Sequelae,—The complications of typicoid in early life are infrequent and usually mild. Bronchitis is present in most of the avere cases. Presemonia has been noted in nine per cent of the cases typical by various authors. Both serous and pureless effusions into the chest are occasionally seen, and sometimes absents of the lung.

Complications referable to the nervous system are not very frequent, but are of much interest. Meningitis is extremely rare. Morse has solicited twenty-one cases of aphasia, in two of which it was clearly due to embolism; in the remainder, however, it apparently was not dependent upon any organic lesion. In two-thirds of the cases it came on during convalescence, and in nearly all complete recovery occurred after an average duration of three weeks. Aphasia usually followed a severe type of the discuse, and in most of the cases was not accompanied by any other paralysis so by mental disturbance. Insanity is a rare sequel of typheid in children, the usual type being acute mania. Recovery is usually complete. Chosen is seen rather oftener than after the other infectious discuses.

Otitis is not an infrequent complication, occurring much oftener than in adults. It is principally seen in young children and during the cold season. Among the less frequent complications may be mentioned; parotitis, which is usually supportative and is seen in septic cases; abscess of the liver, examples of which have been reported by Bokas, Asch, and others; gangrenous inflammation of the mouth or genitals; pericarditis, codocarditis, and peritonitis, supportative inflammations of joints, multiple abscesses and furunculosis. Tuberculosis of the language banes not infrequently follows typhoid.

Diagnosis.—The diagnostic symptoms of typhoid are, the Widal blood reaction, the discovery of the bacilli in the blood, nrine or feces, the cruption, the coarse of the temperature, the enlargement of the spleen and the abdominal symptoms—diarrhea, tympanites, hemorrhage, and perforation.

The Widal reaction is present at some period in from ninety-five to ninety-right per cent of the cases, and thus becomes the most valuable single symptom for diagnosis. It is seldom obtained before the seventh day and frequently not before the tenth or twelfth; it may not be present until convalescence or a relapse. Repeated tests should always be made if the first reaction is negative or doubtful. The reaction is therefore of much less value for an early than for an exact diagnosis. A positive reaction may be present if the patient has perviously had typhoid, something much less likely to be the case with children than with adults; in ture instances it has been obtained in other diseases or in health when no history of previous typhoid existed. Both these conditions, however, are very exceptional, and a positive reaction may as a rule be taken to establish the diagnosis.

Typhoid burilli may be demonstrated in the stools by enliture in a large proportion of the cases. They are found in the urine, usually in the latter part of the disease, in about one-third the cases. Their discovery in either of these discharges is conclusive evidence of previous or existing typhoid. An examination of both urine and focus should, if possible, be made in all doubtful cases.

The course of the temperature is an important aid to diagnosis, but alone is not to be depended upon. The characteristic feature is a fewer which continues for two, three, or four weeks, and subsides gradually. The variations from the adult type have already been mentioned, also the frequency of the cruption, the enlargement of the spleen, and the abdominal symptoms. We are not warranted in making the diagnosis of typhoid, if repeated tests fail to show the Widal reaction or if the cruption and splenic enlargement are absent, and no bacilli can be demonstrated in the blood or discharges, no matter what the course of the temperature may be.

One should besitate to make the diagnosis of typhoid in a child under two years old, unless typhoid is precalent in the community. The great majority of specudic cases reported as occurring in infancy are probably not typhoid. After the fifth year the disease is more frequent, and its symptoms in general resemble those seen in adults, except in

severity.

A differential diagnosis is to be made from malarial fever, ileocolitis, meningitis, tuberculosis, and from other ill-defined continuous fevers of unknown origin. From malarial fever the diagnosis is to be made by the temperature curve, the organisms in the blood, and the effect of quion. In most of the cases of malaria the temperature will be found to teach the normal at some time in the twenty-four hours. The administration of full doses of quinin is a diagnostic test of much practical importance; an irregular or remittent fever which yields promptly to quinic is most certainly not typhoid.

Hescolitis and typhoid fever are not often confounded. The former is chiefly seen in the first three years of life, a time when typhoid is rare. The intestinal symptoms of ileocolitis are marked even though the temperature is not high, and they are altogether more severe than is usual in typhoid; while colorgement of the spleen, tympenites, and the erup-

tion are not present.

The cerebral symptoms of typhoid may be difficult to distinguish from meningitis, unless one has watched their development. Irregular respiration, a slow, irregular pulse, localized paralysis and complete come are seldon, if ever, seen in typhoid, and a retracted alsomen very rarely, while the enlarged spleen and the peculiar eruption are not seen in meningitis.

General tuberculosis very often resembles typhoid so closely that a differential diagnosis is almost impossible from symptoms alone until local signs of tuberculosis have appeared, usually in the lungs. The entaneous test is in most cases a valuable aid.

Prognosis.—Of 2,623 cases in children, collected from the reports of twelve different writers, the mortality was 5.4 per cent. These are, however, almost all taken from hospital reports, where as a rule the mildest cases are not brought for treatment. The mortality of the disease in children over three years old probably does not exceed three or four percent. Death seldem occurs from the discuse itself, but usually from some arcident or complication, the most frequent being pursuancia and intestinal hemorrhage or perforation. Grillith's collection of cases occurring in infancy indicates a much higher mortality for this period. The deathrate for the first year reached nearly fifty per cent.

Treatment.—The usually low mortality of this disease shows how successful all methods of treatment are likely to be considered. In the great majority of cases very little active treatment is required. Every patient with typhoid should be put to bed and kept there during the febrile period, and a few days beyond it, no matter how mult the attachmay be. The diet should remain of sterilized milk, broths, cereal gracks milk toast, seft eggs, custard, and plain ice-cream. These articles should be given liberally every four or five hours, but not pushed beyond the desire of the patient. Milk may be diluted, and knows or buttermik may be substituted for it if the stemach is irritable. Plenty of water should be given. Solid food should not be allowed until the temperature is normal.

Both the urine and feces should be immediately and throughly disinfected by a solution of carbolic 1:20. If the movements are in a chamber or a bed-pun they should be covered with this solution for at least six hours before they are thrown into the water-closet. If napkins or dispers are used, they should be scaked in some effective antiseptic solution for twelve hours and then thoroughly builed. Sheets stained by discharges should be treated in the same way, and all bed-tinen should be boiled for an hour, apart from the washing of the family. The officiency of hexamethylenamin (urotropin) in removing typhoid bacilli from the arine seems now to be well established. It should be given at the close of the attack in does of three to free grains, three times a day, and continued for a week or ten days.

Diarrhea calls for treatment only when the movements exceed four or five in twenty-four hours. If no more than this number are present, they should not be interfered with. Opium and bismuth are underlikedly the best means for controlling excessive diarrhea, but care should be taken that they are not pushed to the degree of inducing constipution.

Constitution early in the discuss may be relieved by easter oil, but ell active purgation should be avoided. Later in the discuss irrigation of the colon with topid water is better than anything else. On the whole, constitution is more troublesome to overcome than diarrhea.

Tymponites does not often require treatment; it may be relieved by turpentine stupes, by a giverin suppository, or a small giverin injection (one temporarial of giverin to four cursos of mater), or, better still, by the use of the rectal tube. If the distention is continuous and extreme it may be necessary to stop all food for several hours until it is relieved.

Whenever the temperature remains above 104° F. antipyretic measures are indicated. In mild cases cold or topid spongine is generally efficient. In those which do not yield to such measures, boths may be employed. Not all children bear boths well, and considerable discretion should be used in employing them. One should be guided quite as much by the effect upon the pulse and the nervous system as by the temperature. The best method is usually the graduated both; the child is placed in the tub with the water at a temperature of 25° or 100° F.; this is gradually lowered to 25°, 90°, or even 85° F., but seldem lower. The body should be actively rubbed while the shild is in the both, to present shock and cardiac degression. The puck may be substituted for the both when circumstances make the latter impracticable. The both or pack should be repeated in an average case in from three to six hours.

The milder nervous symptoms—bendsche, restlessness, sleeplessness, etc.—may be relieved by an occasional dose of phemoetin, either alone or in combination with the bromids, or by cool or tepid sponging; the more severe ones usually occur with high temperature, and are best contrailed by the bath.

Stimulants in most of the cases are not called for. They are to be given according to the indications afforded by the pulse, the first sound of the heart, and the child's general condition. They are seldom needed surfar than the end of the second week. Intestinal homorrhage calls for absolute quiet, morphin hypodermically, and an ice-coil to the abdonen, nothing being given by mouth except stimulants and possibly opium. Intestinal perforation is accessfully treated only by early laparotomy.

CHAPTER X

TUBERCULOSIS

Transcrizers is an infectious, communicable disease due to the bacillus tuberculosis of Koch. It may be local or general, and may insolve any organ and almost any structure in the body.

Etiology,—Age and Frequency.—No age is exempt from inherculosis. It was formerly believed that the disease was rare in infancy, but recent observations have shown the opposite to be the case.

Statistics taken chiefly from three New York institutions where only infants and young children are received give the following figures for 382 cases of tuberculosis, the diagnosis being confirmed by autopey in nearly every instance: In the first year there were 160 cases, and of these 67 were under six months, 10 of which were under three menths of age. The frequency of tuberculosis appears to increase steadily as age advances, as shown by the following table, in which results found by Vessler and Johnston in St. Leuis are compared with those of Humburger and Monti and von Pirquet in Vienna. The cutaneous or intracutaneous test was applied in all instances. Cases of clinical tuberculosis were excluded.

400	Vender and Johnston. St. Louis			root and Monti. Vocata	res Pireart.		
Apr (posmi)	Es of	Percentage of Telephonologie	So of Cons.	Permutage of Tuberminute	No of Cases	Principal of Februaries	
Under 1	202 109 163	1.5 5.5 19	21 46 111	0 9 27	385 80 162	0 0 13	
4 to 6	172 152 126	19 23 29 30 31	111 26 61 45	51 61 73 94	343	27	
0 to 12	94	31 28	34	94 94	147	79	
	1,125	21	532	51	1,129	22.51	

[&]quot;The total mericage of telegrators is small on account of the large number of infants total.

From the facts at hand it would seem that the percentage of children with tuberculosis is much greater in Europe than in this country. The following table gives figures for three institutions in New York, as compared with data taken from Vienna and Munich. The difference in the ages of the children makes comparison difficult.

Frequency of Tuberculosis as Shown by Autopoies

Institution.	Age of Patients	No. of Lebopaire	Ma. Morer ing Tubers culosia.	Passentage Showing Tubercolonia		
N. Y. Infant Asylom Babes' Hosp, let series Babes' Hosp, 2d series N. Y. Founding Hosp. Midler—Manick Hamburger—Vienna.	Nearly all under 215 years 2 2 3 6 2 3 6 Children of all ages All ages up to 14 years (Including only children) of 2 years and under.)	726 1,000 1,330 1,000 500 848 497	56 108 178 136 200 205 120	8.0 per cent 16.8 " 13.5 " 13.6 " 40.0 " 40.0 "		

These percentages are not to be taken to represent the occurrence of telerculosis in the community generally, but only its frequency in the class which furnishes hospital and institution immates. Nor are these figures to be interpreted as showing the percentage of active tubersulosis. In the cases slowing tubercubess at autopsy nearly enesthird of the number died from other diseases, intercubes being latent and its existence being discovered only post morters. Likewise in nearly anofith of the cases giving positive skin reactions there were no evifraces of active tubercubesis.

Predisposing Causes.-These Include all the conditions which bring glost a diminished resistance of the hady to toberenloss infection. This enceptibility may be inherited, as when purents have suffered from bubecalais or other constitutional disease-syphilis, alsoholism, etc. It may be due to the fact that children have been reared in crowded city tesements, in institutions, or under other unfavorable surroundings. A local predisposition may be afforded by any pathological condition of the organs or minous membranes expected to infection. Thus, adenced growths of the planyax or large tono's favor the development of tuberculosis of these structures and secondarily of cervical admitis; and frequent attacks of bronchitis may precede pulniquary tuberculosis. Certain infection diseases, particularly measles, whooping-cough, and inflazma, increase a child's susceptibility to inherenlosis, but they chiefly cause a latent tuberculesis to develop into an active process. General or pul-mentry tuberculesis is therefore often seen as a sequel to the diseases mentioned, the latent focus for which has been tuberculous breachial classic.

Moder of Infection,-Intra-uterine infection, although rare, has been established by the report of a number of complete and well-matheatisrated cases. Tuberculous of the placenta is more frequent. In most of the cases of congenital tuberculous the mother has been suffering from the disease in an adenteed form, and the child is either still-born or des soon after birth. Besides tuberculosis of the planeats, taberdo badlli are found in the organs of the shild, and, when life is prolonged, there are generalized lessons showing infection through the blood. these notates have been observed in the umbilical reed. Intra-attrine infection is highly probable in many of the children born of inherralous mothers, who slevelop the disease during the first few months of hife, although they may show no evidence of it at hirth. Among our own cases, there was one only twenty days old and another six weeks old. The chilfrom were born permuturely of mothers sufering from advanced talerculinis. Besides other lessons, the autopsy showed, in the case of one mother, tuberculous of the endemotrions.

Taberenius may be communicated by direct inoculation, as in the use of a bite from a person suffering from the disease, several instances of which are on record. The rele of communication performed by a rabbi suffering from tuberculosis we have known to cause the disease. One of the most striking instances of direct infection is that reported by Reich. In a town of about 1,300 inhabitants, the obstetric practice was divided between two midwives. Within fourteen months no less than ten infants, who had been delivered by one of these women, slied of tuberculous meningitis. In none of these families was there a history of tuberculous. This midwife was found to be suffering from pulmorary suberculous, and died from that disease. It was her custom to remove the mucus from the month of the newly-born infants by direct month-to-month aspiration, and then to establish respiration by blowing into the race. In the practice of the other midwife, who was healthy, no cases of tuberculosis occurred, although she treated the newly-born infants in the same fashion.

Altogether the most frequent means by which young children acquire tuberculosis is from association with persons suffering from pulminary tuborculosis. Since of these are persons in the active stage of the disease; many are supposed to have been sured; in others the disease has not not developed so as to be recognized. Baculli may be directly conveyed by kissing. Dried sputum containing bacilli may become a part of the dust of the room; it may be inhaled or it may be introduced into the mouths of children by hands, toys, or other objects. The source of infection is usually one or other purent or some member of the househeld-a nurse, caretaker, servant, or a frequent visitor. A history of such exposure was definitely traced in forty-four per cent of 191 consecutive cases of Interentosis in young children which were investigated at the Balies' Hospital. These figures do not represent the proportion of the cases in which the disease is so contracted. There is a very much larger number in which this connection can not be traced. Doubtless exposure antedates symptoms by a number of weeks at least, often by several menths. In instances where it could be pretty accurately accurately accurately tained, the interval between exposure and development of symptoms was from four to twolve weeks.

Infection may take place from beds, rooms, sleeping cars, or any apartments previously occupied by intervalous patients; from dishes or special from glasses at public drinking places; also though very rarely from the ment of tuberculous rattle. Our own observations lead as to the conclusion that only a very small proportion of children contract takerculous in these indirect ways. Infection through milk is, however, of not infrequent occurrence. (See Chapter II, page 134, The Infant's Distary.) It has been repeatedly shown that a considerable percentage of the milk offered for sale in cities contains takerele tuculti. In almost all instances they are of the bosine type. However, they are usually present in small numbers and in most case.

doubtless pass through the digestive tract without inducing infection.3

Types of Racilli.—Important information in regard to the source of infection is obtained from a study of the type of organism present in the different varieties of tuberculosis.

Park and Krumwiede give the following table of results of 543 cases of taberculosis in children studies. About smethird of these were insestigated by them personally; the remaining two-thirds were collected tures.

Loine	Children Li	nder Symm	A 6=31	A Sec 28 Years.	
Diene	Bono	Incia	Down	Borine	
Pulmonary Adentia, anillary or inguinal Adentia, servical Abdonatal Generalized Generalized and incontary origin Generalized and incontary origin Generalized and meningual Meningual Boses and points* Scin. Genito-aminary	15 10 17 17 17 18 28 27 27	1 0 24 14 17 15 10 1 0 0	14 36 8 5 3 1 10 3 41 4	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
	291	76	131	15	

^{*} Preser states that "of a proper of reases of from and joint Inforced has ended in Edinburgh 52 per each more horses in their origin." Apparently the insidence of horses infration, carries constitutely of different comparison. The inforceme is that the milk acquire of Problems is more likely to be mirror than that of other places.

These figures indicate that nearly all pulmonary and meningeal toberculous as well as tuberculous of bones and joints is human in origin.

^{&#}x27;In this connection the following incident is interesting as bouring upon the other side of the question: Near a large American sity was a fancy stock from of registered Jersey cows, which amplied milk for table use and infant feeding to a large number of families in the wealthiest part of the city, for a period of over ten years. At the end of that time the taberralin test was used for the first time, and 45 per cent of these cove were found to be taberculous, and very killed by order of the State Board of Health. The diagnosis was confreed by autopies upon the animals in every instance. An investigation was natitated among the children who had been fed upon this milk, but in only one case of many hundreds could it be learned that tubercolosis had developed. sail in this metapor it was by no means established that the milk had been the sauce of infection. It should be stated that this was before the days of sterilizmy milk for infant feeding. Besides the families who took the milk in the manar mentioned, the employees at the fatta were accustomed to drink the Attended milk in large quantities daily as a beverage in the place of water. Many of them continued to do this for years, sail yet not one of them developed takerodonic.

but that on the other hand, independent affecting chiefly the absorger or springing from the alimentary tract, and tuberculosis of the rervical glands is frequently better in origin.

Infection from the most of tuberculous animals is a possibility, but hardly more. Bellinger's experiments in feeding animals with the expressed fator of such most gave negative results.

Paths of Infection of the Tubercle Bucillus. Twherele bacilli may gain entrance to the body through the respiratory or the alimentary tract or the skin, the last, however, being so rare that it needs only to be mentioned. In infancy and early childhood infection is undoubtedly most frequent through the respiratory tract. The situation of the primary lesions strongly supports this view. The infection is the result of the inhalation of talercle havilli, probably in dried sputum, and is therefere acarly always an infection with the human type of the tubercle bacilless. Infection through the alimentary tract is by way of the tonsils or the intestines, and either the human or boring type of organism may be introduced into the body in this way. If it is the human type, in all probability the patient himself is suffering from pulmenary talerralous and the topols or the intestines are infected from the sputum coughed up. There is also the possibility of human tuburcle bucilli being taken into the mouth from contaminated articles or in milk. Bovine infection almost always results from drinking milk from tuberrulous cows.

Animal experiments have shown conclusively that bucilli may pass through a muses membrane without inducing either a macroscopical or microscopical form of tuberculous discuss but that penetration is much vasier if the muorus membrane is the seat of a cutarrhal inflammation or if the spithelium has been injured. While it is possible that infection of the cervical, mediastinal and trachesbrourhial glarify may take place without a lexion of the muous membrane which these lymph nodes drain, recent studies have shown that it is very uncommon. Thus, with luberenlosis of the cerrical glands, pathological examination of the tenals and insculation experiments show that the tonsile are usually the seat of tuberculous disease. The same is true of the mescateric glands. To expericial examination, the musous membrans of the intestinal tract may appear normal; but careful examination of it has in our experience almost always resulted in the discovery of one or more tuberculous heights. Such is the case also with the lungs, as shown by Parrot, Herconit, Kiss, H. Albrecht and Ghon. The tuberels bacilli which pass the upper respiratory tract may not be arroted until the smaller bronchi are reached. In one of these they set up a localized takerculous process which may remain very small, but frequently reaches the size of a pea. This area undergoes the sedinary changes induced by the tubercle bacilli and eventsully pecrosis or perhaps calcification occurs. The tuberculous focus

is frequently surrounded by fairly firm filteens tissue. From this original reimousey focus, infection of the trachesbrouchial glap is takes place by way of the lymphatics. The focus may remain small and apparently importants. Further development of the intercubus may take place trees the tracheobroughtal glands, either in the form of a diffuse inflammation spreading into the parenchyma of the Imag along the lymphatics, or from the softening and rupture of the gland either into a bronchus or into a vein. The original tale realous beson in the lung on account of its small size may be overlooked, but careful examination will usually disclose it. In a series of 169 autopoies at the Babies' Hospital upon children (mostly infants) with full-resulting broughtal glands, Bartlett, and Wellstein found pulmorary lesions in 158 cases, or 93.5 per cent. 6hon found, in 184 autopsies upon children with tuberculous bronchial clauds, a primary pulmonary focus in 150, se 93,4 per cent. It was his opinion that more careful examination would probably have revealed the focus in others. The changes in the interculous fracticulous ball clards are those of onlinery talerrulosis showhere—conrection, swelling, cell preliferation and easeation or the process may be arrested at any point and the products of inflammation become encapsulated by the proliferation of fibrous tisens in which condition they may remain latent in the body for an indefinite number of years, possibly for a lifetime. This cours in many children and is consistent with every surveyed sign of health, but it is a smooldering ember which at any time may be fanned into flame under the stimulus of an inflammation excited by some other CEDAN.

Issiens.—In the table (p. 1074) are given the lesions found in 235 antipairs, of which we have notes. These represent the lesions of infancy and early childrend, seventy per cent of these children being two years old or under. For companion there are given statistics of 131 autopoies from the Pendlebury Hospital, Manchester, England. For of the children in this series were under three years old. The greater frequency of abdominal tuberculous, especially tuberculous peritonitis, will be reted. This difference obtains in nearly all the English statistics of the discuss.

The Varieties of Taberculusia zero at Different Ages.—During the first two years of life, tuberculusis most frequently involves the lungs and branchial lymph nodes. It is the meningeal or polaneously process which must often is the cause of death. Death from other forms of tuberculosis is rare at this time of life. Of 232 deaths from tuberculosis in the first three years of life, meningitis was the same in 23, tuberculous peritonitis in only one, and hemorebage from a tuberculous after of the polestine in one.

After the around year, tuberculosis of the bones, cervical and mesen-

Frequency of the Different Visceral Lesions of Tuberculosis

Custon	Present Care;† 268 astopsin triofy under these pours		Predictory Hopital Reports. 131 auropoies (risely over three years).	
Longs Plears Plears Broachial Isaaple nodes Brain Lover Spleen Keineye Stomoch Intestoes Mescuteric lymph nodes Perimeents Perimeents Perimeents Thymas Supercent capacies Pancress	178 191 88 110 118 22 10	92.1 per cent 36.5 81.5 83.3 89.8 74.9 80.6 2.7 43.1 46.2 8.6 3.9 0.4 1.9 1.6 1.5	122 100 91 86 76 54 1 85 77 37 4	90.0 per cent 76.0 + 46.0 + 45.0 + 45.0 + 41.0 + 0.8 + 30.0 + 30.0 + 38.0 + 38.0 + 1.6 per cent

[&]quot;In a second series of 178 autopsies at the Bobies' Hospital the lungs were second of 924 per cent; the broachest breigh nodes in 955 per cent; the brain is 387 per cent, and the measureme byreph nodes in 645 per cent.

teric lymph under, peritoneum, and intestines becomes more frequent, and any of them may occur as the principal lesion, although at antopsy the lungs are usually involved to some degree.

Pulseousy Lesions.—As compared with that of adults, the pulmonary tuberculosis of young children is more widely diffused, and the predominance of rases in which the lesion is in the upper lokes is less marked, though it still exists. In those who have pussed the sixth ar seventh year, the pathological processes resemble those of whill life. Although localized tuberculous processes are frequently met with in patients dying from other discusses, those who die from tuberculous usually show wide-spread become of the lungs.

I. Militry Tuberculosis of the Lings.—In nearly every one of pultromary tuberculosis, military tubercless are found in some part of the bing, usually upon the surface and in the vicinity of some older process. Occasionally, they are distributed throughout nearly the whole of both lurgs. In some places the lung, with the exception of these numerous gray granulations, appears quite normal; in others it is congested, and shows between the tubercles the lesions of simple branchoppennions in its turious stages. There is also an acute branchitis of the middle-sized and smaller branch. The microscope shows that the intercles nearly develop in the walls of the small bronchi or the blood-reasets. In their gross appearance, the longs in these cases resemble those in ordinary arute bronchoppennious, with the exception that everywhere upon the unface and throughout the substance of the lung are seen the small gray granulations, and in most cases some small yellow tuberculous nodales. The pleura is usually normal except for the presence of the tubercles. This form of the discuss represents the rapid dissemination of tubercle burilli throughout the lungs, the miliary tubercles being the result of the inflammation excited by their presence.

2. Tuberculous Bronchopneumonia.—This is the most frequent and the most characteristic form of tuberculous in infants and young chaldren, and it is the one which at this age usually causes death. In this form of the disease there are produced in the lung cassous nodules, or larger caseous areas, some of which have usually undergone softening by the time the case comes to autopoy. The process generally runs a somewhat unharmte course. With the lesions mentioned there are always associated these of simple bronchopneumonia.

The please is involved in almost every case. There may be simply dense connective tissue adhesions which bond the long firmly to the chest wall, the disphragm, and the pericardium, or the please may be greatly thickened and contain caseous deposits. Occasionally emptyons is seen, but it is almost always succulated and small.

Both langs are usually involved, but one to a much greater degree than the other. There are found large areas of consolidation which sometimes involve an entire lobe, but more often smaller areas are seen in averal lobes. These portions of the lung appear much firmer and harder than in ordinary pneumonia. The upper lobes are more often affected than the lower, and especially that part of the lobe which is near the root of the lung, on account of its frequent association with tuberculosis of the brenchial glands; the disease very often extends forward from this point to the middle lobe of the right, or the corresponding part of the led lung. On section the affected part of the lung usually shows many names nodules, varying in size from a pin's head to a walnut, which are of a pule-yellow color, and resemble enseems lymph nodes. They comin giant cells and are usually filled with bosolli, those which have softened containing yellow pus. There is nearly always seen in some part of the lung a large caseous area; and not infrequently there may be diffuse essention of almost an entire lobe (Figs. 173, 175). Sometimes no spot of softening is soon even in these large areas, but in many cavities are present.

Softening and excavation represent the final stages of the process in inferculous presumonia. Softening usually begins in the center of a majors part, often at several points at the same time. Areas of excavation large enough to deserve the name of cavities were present in about half of our autopoies upon toterculous patients, two years old and under. They tary in size from a cherry to a ben's egg, and sometimes a much larger and is seen (Fig. 174). They are usually rather deeply seated, and are partially or entirely filled with caseous masses or pus, but very soldern perforate the pleum, crusing pre-unotherax or proposumetherax. It is rare in a young shild to find savities surrounded by dense filterus walls such as are seen in obles children or in adults; for in infancy the





Fig. 174.—Carry ruce Hannerson Down or Transactions Prestagate. Another view of the same large, the section being made very near the posterior barder of the bing. The stating occupies at the point month the whole of the input labe. At anteppy this early contained numerous bone mesons money, the bigget being the size of a markle. The fower size in numeral. (For history, say Fig. 1784)

process of softening once begun usually advances steadily until the dealer of the patient.

The bronchial lymph nodes are in these mess invariably found to be tuberculous, and not only those at the root of the long, but if a dissection is made, a chain of these tuberculous glands will be found to follow the larger bronchi for some distance into the long (Fig. 175). Sensetimes one may be discovered which has softened and aftersted through into a small broughts.

Microscopical exemination of these cheesy nobiles shows that they nost frequently begin as fulcrealous deposits in the walls of the small broads, either in the mucous membrane, the fibrous cost, or the lymphatice; sametimes, however, they begin in the walls of a small vein or artery.



For IT.—Preservoiry Transcritions, Extravers Consisted on Entry Evan Ave. Biocomical Glavier. Biology.—Colored child I'd years old; signs over left long was fields breaking and flations, suggesting suppress (west)-three examinations of the sputase made for books, all requires. For the last three and a half weeks, impossing showed a regular daily range from 1987 to 100° F.

Asteps: — Almost remidete curvation of left lung; no spots of softening; throughout might lung were small imberetious recision and military transverse. Remichial plants very large and massure, but were broken down; those affected were not only the group at the root of the long but the chain following the main bronchus some distance into the lung week.

Cell proliferation takes place, separating the costs of the bronchus or blood-ressel, and partly or entirely obstructing its lunear. Softening tary take place and the contents be discharged into the branchus or blood-ressel. About this focus other changes of an inflammatory character occur, as a result of which such cheesy nodule is corresponded by a zone of simple branchoperumous which tends, in a measure at least, to limit the taberculous presses. The larger enseme areas are formed by an

extension of this process to the zone of pneumonia which surrounds it; but in its further growth it is still preceded by a simple pneumonia. The rapidity with which the besiens advance differe much in the different cases; in infants the progress is apt to be continuous until the death of the patient; in older children it is usually slower, and interrupted by intervals of arrest and even of partial retrogression.

Not infrequently our sees in the post-morten room one or two caseous, or less frequently calcurrent, nothiles encapoulated by firm, organized connective tissue when a most careful search fails to show any other tuberculous lesion in the lung. If, however, the nodules are widely scattered through the lung, such an arrest of the process is not to be expected.

3. Chronic Pulmonary Tuberculosis, Chronic Phthisis.—In children who have passed the seventh or eighth year the pathological process resembles that seen in adults; but in younger children, and especially in infants, nothing corresponding to it is met with.

At this period the nearest approach to this condition is seen in the cases of tuberculous bronchopneumonia, which run a slow, irregular, and somewhat chronic course. The essential features of the process is these patients is a chronic interstitial branchopneumonia with tuberculous nodules which rarely undergo softening, but usually become encapsulated.

The gress besinus closely resemble those of simple chronic branchapneumonia. There are the same generalized picuritic adhesions and the shrunken cicatricial condition of the part of the lung most affected, with bronchiectasis, compensatory emphysema, etc. The tuberculous nobiles are old and for the most part converted into dense fibrous tissue, in the center of which, however, some softened, caseous areas are often seen.

Branchiel Lymph Nodes (bronchiel glands) .- The prominence of the bosions of the lymph nodes is one of the most striking features of tuberoulosis in infancy and surly childhood. Those which are most frequently affected are connected with the bronchs. The lymph nodes, to which the term "brouchial glands" is generally applied, consist of three groups: the first of which surrounds the tracken; the second is situated at the hifurcation of the tracker and surrounds the primary brought; while the third follows the course of the brough into the lung, being found, according to anatomists, as far as the fourth division. The austamical relations of the different groups should be borne in mind, since upon them the symptoms principally depend. The first group, or the peritmeheal length nodes, are in relation with the superior years cava, the pulmonary artery, the pneumogastric and recurrent larangeal nerves; the second group, at the bifurcation of the tracken, with the cooplague, prouncgastric nerve, and acrts; the third group, with the bronchi and the teameles of the bronchial and pulmanary atteries and vains.



TERRETERIOR OF THE TRACEROSMOSCHOOL LABOR NORTH

From a fairly nonriched child, bost months old, who was under observation for these works, with slight lever and a most severe, beauing, day cough, which was almost constant, and upon which to treatment second to have the elightness effect. At fairlibers were no signs of documents in the lungs, fater there were no less course scattered effect.

There were small haber-show deposits throughout both dauge with quite a large sees of checor pheumonia in the right middle labe, and scattered miliary tubercles in other organs.



All the groups are usually involved at the same time, but in varying degrees, and in most cases those belonging to one long to a greater extent than the other; in our own cases those of the right side have much more often been involved them these of the left. There may be simply two or three tumors as large as a hazelesst, or there may be a mass two or three inches in diameter, which is made up of ten to twenty of these poles fused together by inflammatory products, completely surrounding the tracken and both the large bounds. It is now that the individual clards are more than an inch in diameter, and most of them are smaller than this. A well-marked but not unusual example of this condition is stown in Plate XIII. There is usually found a chain of these tuberculous glands following the course of the large brenchi for some distance rate the lung; cometimes these are almost as large as the external group (Fig. 125); at other times they are not noticed unless a somewhat careful dissection is made. The process is not infrequently more privanced in these deeply scated glands than in those situated at the root of the lang; and lexions here are also more important, as it is very frequently from them that an extension of the process takes place.

The pathological changes through which these glands pass as a result of taberculous infertion are very similar to those already described with reference to the certical glands. Supporation is less frequent than in the region of the neck, while calcific degeneration is much more so. This applies especially to children over three years old. In infancy supporation is not infrequent in the broughtal glands, while at this age calcification is relatively rare. Although the process has gone on to reseation, these inflammatory products with bacilli may become encapsulated, and may remain innocessus for an indefinite period. The bacilli may die or may exist here, living, for years. At my time the old process may be lighted up, and a more or less rapid dissensination of tubercle bacilli take place through the lungs or through the whole body. Latent tuberculosis more frequently exists in the broughtal lymph nodes than in any other structure in the body.

Secondary lesions may be preduced by these lymph nodes. The prenmagnetic and recurrent laryngeal nerves may be surrounded by one of these rheesy masses which may cause pressure or irritation. The coupleages, the traches, or the brunchi may be compressed or opened by ulceration. The experior vena cava usually suffers only compression, but this or my of the other large vessels may be opened. Ulceration may also take place into one of the large or small brunchi or the traches. If the gland has suftened and broken down, and if the brunchus is a small one, the only tenut of this may be a rapid spreading of talescentous infection throughsal the lung. If sudden supture occurs, a large caseous mass may escape into the traches, or a large brunchus, with a result similar to that produced by any other foreign holy. If supparation occurs, the above may rupture into the surrounding cellular tissue, causing mediastical or retra-copingcal aboves. This may open enternally at the exprasterial metch, or in the first or second intercental space, or may observe into any of the large vessels, the cophagus, or the pericardism.

Figure.—This is rarely normal in any case of tuberculosis. In arute general tuberculosis the only lesson may be a deposit of miliary tubercles upon the viscoral plears. In most of the other cases there are found fibrous adhesions over the part of the lung involved, binding it to the pericardium, the disphragm, or the clost wall. The amount of thickening of the plearn varies a good deal, but is rarely great. Plearisy with a seroes offusion is not common in infants or young children; when it occurs it is apt to be accordated. Hemorrhagic exculation is very rare at this age. Empsyma is also rare, being seen in but five per cent of our cases, and then it has been small and succulated. Prenuesthorax and propagamentshorax are very rare in children under three years of age.

Heart.—It is exceptional for the perioardium to be affected even in the most generalized forms of acute military tuberculosis. In such cases the neutal lexion is a deposit of a few gray tubercies upon the vasceral surface. In chronic cases other lexions analogous to those of the plrum may be seen, but very infrequently in childhood. Usually only localized adheritors are present, but we have seen complete obliteration of the pericardial suc from tuberculous information in an infant of cleven months.

In several instances we have seen unlivery tubercles and minute cheesy needules upon the metral endocardison, must frequently in the some arterious of the right ventricle. One case, an infant exteen months old, had such belons in both rentricles and in addition military tubercles upon the tracepid value.

Brain.—Tuberculosis of the brain is very common during infancy, being then associated in nearly all cases with general tuberculosis. Military tubercles are occasionally found in small numbers in cases which have presented no comptons. The lesions of tuberculous meninguits have already been described. Cheesy nobules are rare in infancy, being noted in but 2.5 per cent of our own autopoies, which were mainly on children under three years old; while in the Pendlebury Hospital cases, including those between four and twelve years old, they were noted in 24.4 per cent. These nodules vary in size from a pea to a hen's egg; they are usually associated with tuberculous meningitis, but they may exist alone. When they are large they rank as serebral tumors, being most frequently seen in the cereballum.

Liver.—This is frequently involved in general tuberentosis, although it is doubtful if it is ever the seat of primary infection except in the congenital cases. Usually the only lesion is the presence of military tubereless on its surface and in its substance, and in most cases these are not numerous. They are found in about two-thirds of the cases. In a smaller number there are tuberculous notates of various sines, especially about the biliary ducts. In nearly every pretracted case the liver is markedly fasty. In very late cases of tuberculous of the bones, it is frequently the seat of amyloid degeneration.

Spless.—This is more frequently affected than the liver, but the bolons are similar. The size of the spless is not much increased if only military tuberdes are present; but with tuberculous nodules it may be greatly enlarged. Amyloid degeneration is found under the same conditions as in the liver.

Steamed.—Tuberculesis of the element is one of the rare lesions; both its contents and its acid reaction seem to protect it against direct infection from the mouth. Tubercultus above were seen in five of our autopties, which is a larger proportion than is usually noted.

Interlises.—That these are less seriously affected in infants than in other children is rather surprising when we consider how susceptible are the intestines of infants to other forms of infection. The explanation of this difference seems to be that in infancy intestinal infection is usually scendary to disease of the lungs, primary lesions being relatively rare. Infants die from the more rapid talerendous processes in the lungs or brain before there has been time or opportunity for secondary intestinal lusous of importance to occur. The intestinal besides and those of the meantaric lymph nodes with which they are almost invariably associated, are described elsewhere.

Peritoneum.—In early infancy the peritoneum is not often involved even in general tuberculesis, and at this age it is very rare for it to be the seat of the principal tuberculous process. In older children it is more frequent. In most cases of general tuberculous there are only deposits of unitary tubercles; less frequently there are tuberculous nodules with other inflammatory products. The lessons in these cases are described with Dispuses of the Peritoneum.

Thymas Gigad.—In several of our cases tuberculous modules have been found in the thymns gland, the size varying from a small pen to a landant. All the cases showed also widely disseminated tuberculous lesions.

Penerous.—In a very few of our cases this organ also was the seat of small taberculous nodules, all of them being cases of general tuberculous.

Unequalled Organs.—Serious tuberculosis of any part of the urinary bact is very rare in children. Military tubercles have been found in the bilarys in about one-third of our autopoins on tuberculous patients. They are generally few in number. Large tuberculous nobules of the kidney we very zero before the fourteenth year. Tuberculous nobules are rarely found in the suprarenal capsules. Tuberculosis of the testicle is very rare in children. We have seen but a single instance of it. This was in an eight mouths old child. We have records of two cases of tuberculosis of the prepute and inquirial glands following ritual circumciston, in both cases followed by generalized infection.

Tuberenlosis of the hones and of the external lymph nodes has already been described.

THE CLINICAL FORMS OF TUBERCULOSIS

I. General Tuberculosis.—Cases of tuberculosis present a wide variety in their symptomatology, depending upon the sent of infection, the rapidity with which the bacilli are disseminated through the body, or the numbers in which they enter. The general symptoms often precede the local ones, but are not recognized as those of tuberculosis. Often it is not suspected until the process is quite well advanced in some one organ.

In Invaria,—The early symptoms in infancy are often only those of failing nutrition. The patients are pale, thus, do not gain in weight no matter how feel, and finally lose steadily without sufficient reason. There may be no cough or fover sufficient to attract attention, and the case may even go on to a fatal termination without anything else than simple management having been suspected, inherendosis being first recognized at the autoper.

More frequently, however, there are developed toward the end of the illness both the symptoms and signs of pulmonary disease and fever. These are generally found together, as the process in the lungs is usually the cause of the rise of temperature. The februle symptoms are often not seen until the last few works of life. The course of the temperature is irregular. It is never of the bectic type and rarely high. The usual range is between 100° and 102° P. The pulmonary symptoms are generally few and not very well marked. There is some cough, but it is narely source. The breathing is more rapid than would be explained by the temperature alone. Severe disputes and cyanosis are rare, and are seen only at the close of the disease. The physical signs are those of either localized or general beauchilis. Digestive symptoms are usually present late in the disease, but diarrhed is rarely due to a tuberculous lesion of the intestines.

The progress of the case after constitutional symptoms develop in usually steedily downward, and the child lives but a few weeks at most. Death generally occurs from progressive asthenia without the development of any new symptoms, or cerebral symptoms rapidly develop and the child is carried off in a few days by tuberculous meningitis. Sometimes there is a rapid spreading of the disease in the large, and death occurs with symptoms of acute precuments.

General tuberculosis in infants is to be differentiated from marnsmuswith brouchitis; rarely it may be confounded with hereditary apphilis.

In Other Continues.—The development of active general inherenless in older children is usually pressived by a protracted period of indefinite symptoms. They are perceitantly anomic without evident rensin; they less weight; digestion is disturbed; the appetite is capricious; they sleep badly; they are irritable, fretful, and easily fatigued. These symptoms indicate only a gradual decline in general health, and may readily be explained by many other cames than inhereulosis. They should, however, excite a suspicion of tuberculosis in a child who by surroundings or inheritance is predisposed to that disease.

After these indefinite symptoms have lasted for a few weeks fever is added. Sometimes the predomal symptoms are about or unneticed, and fever is the first evident symptom. From the beginning of fever sense cases progress rapidly to a fatal termination in three or four weeks. In the majority, however, the disease runs a shower course. The fever after exists without evident cause and without any local manifestations of disease. The temperature is not often high, but it is continuous. The tympanites and the rose-colored spats are not present, but the general aspect of the patient is strikingly suggestive of typhoid fever. But the course of the temperature and the duration of the illness show that we have to deal with some other condition.

After the fever has lasted from one to three weeks there develop some signs of localized tubercules is, generally in the lungs, or the fever may decline gradually, and although the patient improves he does not get well. He is still weak and does not gain in weight, and the thermometer shows the existence of a very slight amount of fever. Before long he may grow rapidly worse and the course of the temperature becomes itregular, with alternate exacerbations and remissions. Such an irregular and inexplicable fever ameetimes pundes the physician for several weeks sefore the characteristic features which stamp the process as tuberculous are present. Before very long wasting is added to the fever. This may not be rapid, but is progressive. The tuberculous carbexia is frequently umistakable; but in most of the cases one must wait for the process is advance far enough in some one of the organa to give local signs or symptoms before he can be sure of tuberculosis. In four cases out of five this is in the lungs, and frequently repeated examinations of the sputum may reveal the bacilli. Less often it is in the peritureum, the brain, or a general infection of the lymph glands throughout the body. If in the lungs, the process manifests itself as a broughopucumonia whose talerralous character may scenetimes be suspected from its location-the apex or the moldle of the lung in front—but chiefly from the fact that the general symptoms, fever and wasting, have so long preceded the local signs. From this time, the course may be that of a typical biberculous broughouncements.

If the references process is localized in the brain, there may be coniting, headache, drowences, irregular pulse, irregular respiration, and finally convolutions and comes in abort, the symptoms of interestion recoinguist; if in the peritoneum, there are abdominal distention from gas or fluid, temberness, pain, distribut, or constitution; if in the lymph glands, there is a general unlargement of those situated externally, sometimes with symptoms indicating similar changes in those at the root of the long.

II Pulmonary Taberculosis.—Toleronlosis of the lungs in children may be over in a variety of clinical forms which correspond with the different publishesical conditions. The pulhological conditions are often associated, yet the main clinical types are sufficiently distinct to give quite a definite picture. These types are: (1) miliary interculosis of the lungs; (2) bronchitis with small, mattered, toleroulous nadules; (3) inheroulous bronchopneumonia, with areas of comolidation, often extensive, which may be followed by cascation and excavation, or by chronic filmum indunation.

Minage Trumcrisons or vine Levous.—This is not a common form of politionary tolerculosis, but may be uset with even in young infants. Both the general and polinomary symptoms and the physical signs are rather obscure and indefinite, and often the diagnosis is not made. Occasionally the only symptoms are those of marasmos, neither force nor physical signs in the closet being present (Fig. 176). As we have seen it in young children, it has added been attended by high temperature, 191° to 103° F, being the usual range. Throughout the greater part of the disease it is often lower than this, and toward the close perhaps rather higher. It is not a bactic type of fever, and it selden touches the normal line.

The duration of the disease in those cases, after fairly definite symptoms begin, varies from ten days to a menth. At first, and often for two or three weeks, the temperature is almost the only symptom. Cought is slight, inconstant, and selden loose. There is no spatum. The respirations are only moderately accelerated, in many cases not enough to draw attention to the lungs as the sent of disease. There is no rapid wasting, the loss in weight being usually not more than would be expected with any other febrile disease. Note of the other symptoms suggests inherentosis. The moral problem in diagnosis is to discover the cause of the fever. Often the most careful examinations of the sheet made daily reveal nothing more than a few scattered riles. These change

in position from time to time, and it frequently happens that for days no rules are heard. After the disease has progressed somewhat further, the liver and spicen are generally enlarged. Cerebral symptoms may develop and the case terminate as tobercalous maningitis, but more often it is the pulmonary symptoms which are dominant. The respirations become more rapid; the cough is frequent, but rarely loos; there may be attacks of symposis. Still the only definite signs are the rules, now free and mobil, and diffused generally over the clost. The case usually



For 176.—Minister Transactions of the Levys Relate further mouths sid; sympofewer of mornouses, no observation of temperature; informalides of the skin; positive you Propert resettion; no polynomical against a symptoms. The dislogancy shows great numbers of small information deposits numbered through both lange.

ends in death by echanistion, but without rapid or marked waiting. One of the most striking things in the clinical picture is the disproportion between the security of the general and pulmonary symptoms and the few physical signs in the chest.

Transcrious Browcuttes.—This is not an infrequent condition two in infancy. In many, perhaps in most, cases it marks the carliest clinical stage of a Inherculous bronchoptermonia, but this is not always true. The condition seems, therefore, of sufficient importance to require separate consideration. Besides bronchitie, there are found at autopsy a few small tuberculous nodules and tuberculosis of the bronchial glands, although these may give neither signs nor symptoms during life. The

symptoms of this condition are few and not distinctive, and may differ in no respect from beominitis due to other causes. Tuberculosis may not even be suspected until the lexica has so far developed as to be classed as tuberculous beonehopneumonia. Cough is present, but has nothing characteristic about it except its penistener. Fever may be about for a long time, but comes as the disease afrances. Then it is low and very irregular, the temperature generally varying from 20° to 10L5° E. There may be slow but progressive loss in weight, or the infant may good regularly for a number of weeks in spite of the cough. This fact often leads to a mistake in diagnosis. The nutrition is influenced much more by the condition of the digestive organs than by the interculous process. Other symptoms generally regarded as belonging to early tuberculosis, such as pallor, anemia, perspiration, etc., are usually about The physical signs are few and not characteristic. Scattered riles, sometimes coarse and sometimes finer, but inconstant, are all the algas that are present for a long time, often several weeks.

Cases like these are recognized as tuberrulous only by finding bacilliin the sputom or by the telescolin test. It has been our custom to consider as probably tuberculous every infant who has been for any length of time in contact with a tuberculous parent or other member of a household. Regarding all such infants as suspicious has led us in hospital practice to search the sputum carefully for bacilli, with the result that we have found them, sometimes in great numbers, in infants whose only outward symptom was a moderate cough, and who were admitted to the hospital for some other reason. At other times the condition has been mexpectedly discovered by making routine tuberculin skin tests. A typical reaction laying been obtained in a child not hitherto suspected, the diagnosis has been subsequently confermed by finding bucilli in the sputum, although the only signs in the chost were a few riles and the only outward symptom a moderate cough. How many infants there are with such a form of tuberculous and how long such a condition may outtime without more definite signs developing, one can only conjecture; but the number of such cases is, we are convinced, not small. They form a very distinct but important group of tobercalous cases. The regularity with which becilli are present in the sputum indicates what a factor ther may be in spreading the disease. How many recover and in how many the disease goes on to the development of more serious leatons it is impossible to sor.

Transcences Beoremorenezeovia.—This is altogether the most frequent form of talerculosis seen in young children. It may be premary in the lungs or it may be secondary to tuberculosis classifier, most frequently in the bronchial glands. It may be preceded by constitutional symptoms such as those described under the head of general tuberculosis. It may follow single or repeated attacks of what was apparently a simple acute bronchitis or broachopneumonia, whether that occurred as a primary disease or was in turn a sequel to one of the infectious diseases, especially measles, whosping-cough, or influenza.

Telegralisus brouchopneumonia, as a rule, begins gradually, and its entrie is less rapid than simple brouchaquesmonia, its peogress being generally marked by weeks. When primary it is often preceded by supplemen described as tuberculous broadsitis. When it follows one of the infectious discusses, it is usually sugrafted upon the original disone without any interrening symptoms. The early symptoms are cough, rapid respiration, fever, progressive weakness, and memia. The weight may be at first stationary, but soon there is steady loss, which may contime until there is marked emociation. At first the usual range of temperature is from 100° to 102° F.; later it is rather higher than this. In many of the cases it differs little from the temperature of simple branchojustinosis. Sometimes the general symptoms are severe and the physical signs wide-spread, and yet the range of temperature is not high. To be sure, this is occasionally seen in simple bronchopneumonia, but it is more frequent in tuberculosis. The sough early in the disease is slight, but later becomes severe and aften distressing. In infants and young children it may be of a perocessual character, roundling pertunes. Experioration is not often seen in those under five years old. Bloody expectoration is very rare in children.

The conditions in the longs which give physical signs are bronchitic
of the smaller tubes with areas of complete or partial consolidation. In
maracter, these signs are identical with those of simple bronchepacumaria. They may be scattered throughout the whole of both longs; but
when localized they are more frequently in the upper than in the lower
lobes, and more frequently in front than behind. Although both lungs
are involved, they are usually not affected to the same degree. The
jutient may die before signs of complete consolidation are present; more
often there gradually develop areas of consolidation, as shown by bronthial breathing and voice and duiness. In some cases although widespend lesions are found at autopsy the physical signs during life are
few and indefinite; sometimes there may be almost note. (See Fig. 176.)

From the beginning of scate symptoms the progress of the discuss is steadily discussed, death occurring as in simple beauthopseumonia. The end is marked by cyanosis, great dyspace, weak pulse, and extreme prestration. In a few cases there develop cerebral symptoms, indicating talerculous discuss of the brain. Such symptoms may be the first to had the physician to suspect the process to be a tuberculous one. But seen this is not conclusive, for one may be dealing with an acute mening this due to the passumococcus. Lumbur puncture will decide.

In the more protracted cases there are found in the lungs caseous nodules, with larger areas of caseous pastunoum, and usually seems areas of softening. The process is not usually so generalized as in the cases just described, but as in them there is always associated a certain amount of simple pastunoum. The pathological process may terminate (1) in diffuse casestion, or (2) in localized casestion and excavation, or (3)



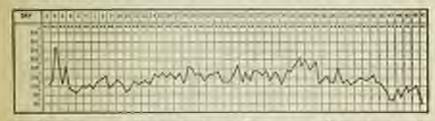


Fig. 177.—Tremscences Forgeries Manages. Child eigher menths old, immite of an institution. Chart begins us fifth they of a severe but encomplicated attack of mention, and shows a natural decline to natural. Forget their returned and continued till death, newton weaks lates. Record for the period which is smitted was much life than which immediately precedes and follows. Early symptoms not across only slow wasting, slight cough and follows. Wattered elles throughout cheek. Signs of consolidation not distinct till eighth week: they present in right upper lobe, Toward the end, rapid remarkable, marked pulsamany symptoms, and signs of weight at right upper. Anteppy showed a large variety, extensive tubercalous deposits throughout both lungs and in partly all abdustinal organs.

in partial resolution and the development of a chronic fibreid presmenta. In the first two varieties the progress is as a rule steadily downward to a fatal termination, which takes place in from one to three menths. In the third form, which is described later, there is partial recovery.

The mode of easet will depend upon the conditions under which the discuss develops. When the general symptoms of tuberculosis have preceded those in the lungs, the evolution of the latter is gradual, with cough, rapid breathing, dyspnon, incremed prostration, etc. When the pulmonary symptoms are present from the beginning, they are the same as in simple broachopnessments, with the exception that they usually come on less acutely. The latter is true of cases which are secondary to some other form of tuberoutons in the bones, paritoneum, etc.

When pulmonary tuberculous follows measles (Fig. 177) or whooping-cough which has been complicated by simple paramonia, the early symptoms may present no musual features. After two or three weeks the temperature gradually falls, and the physical signs improve, but arither quite disappears. The cough continues, though its severity somewhat abstes. In the course of a few weeks the child, who has meanwhile improved somewhat in his general condition, becomes distinctly worse, often without any assignable cause. The temperature rises to 102° or 103° F.; the cough increases, and an extension of the disease in the



For 178.—Trumemous Perrascone: General Terrasconess. Patient electer months all, and under observation at the time he was indeen such. Chart of extire allower is given. Disease begins at an units investigation in lower part of left artile and operate to entire lower lobe. Early mone of remolekulines: at end of two works, flatness so marked that a needle was inserted fluid being suspected. Venitted beapeauty, and had been discharges from howels throughout the filmes; abdomen much smaller for last two works. Andrew showed elevely procured in of part of the upper and the estimated lower late, where there were two small creation. Becaut inherity is found throughout right long, and extensive deposits in abdominal argums with protocolitic, and intentinal talents.

large is evident by the physical signs. In other cases the progress of the disease after a posturossia which complicates measles is without an intervening period of apparent improvement. It construes happens that the attack of measles or whosping-cough is not accompanied by any serious pulmonary symptoms, and the case goes on to apparent recovery, except that there remain anemia, a slight cough, and favor. The temperature, although not high, persists; but it may be two or three weeks before there are present definite symptoms and signs of disease in the large.

Fever is a constant accompanional of all active tubercolous processes in the lungs in the child as in the adult, it being absent only during the periods of remission which accur in the cases of slow and irregular progress. It is a very important guide to the progress of the disease. The early fever may depend in part upon coexisting broadspressmonia, and its course may resemble that of simple pacamonia of the protracted variety. There is no typical curve. The fever is not often steadily high,

and in many cases it is never so (Fig. 178). It frequently runs for several days between 99° and 102° F., and then, without evident cause, rices to 104° F. or over. In infants the morning temperature is frequently subnormal, although the evening temperature may be 102° or 103° F. Even toward the close of the discuss, when softening and breaking down are actively going on, the regular bectic temperature of adults is rarely seen in a young child (Fig. 179). While the presence of fever is of great significance, its course has almost no diagnostic importance in early life. Especially should one beware of drawing the conclusion that, because the type of fever is not heetic, there is no breaking down of the lung.

Sweating belongs only to the late stage of the disease, and is usually

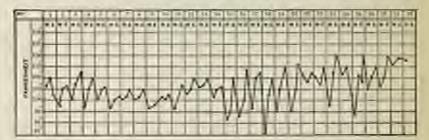


Fig. 178.—Transcence Precessora with Extrasory Servicine and Eucavarion A defeate child, thisteen isseethe old; weight, 16 people, come under observation four works before death, with committation at apex of right lung. Signs increased in intensity, and extended in sees used there were heard, from clavide to below the nipple, emagerated benefied in size and breathing and many most rible; persuade note was flat, behind, the inert signs at enteress open. No defined signs of a cavity to bectle fever, no seesiting. Judgery showed large cavity (Fig. 175) at right next partly filled with recommendate; diffuse careers presented. (Fig. 175) of the rest of right upper lobe, with southered deposits in the other lobes, the opposite lung, and a lew in the abbundant agence.

associated with the lactic type of fover; both these are regular symptoms in children over seven years old, but not in very young children.

Wasting, like fever, is characteristic of most active tubercalous processes. When fever and wasting are associated, tuberculosis should be suspected, no matter how obscure the other symptoms may be. The wasting is not always rapid, but it is usually continuous. In infants and very young children exceptions to this rule are not infrequent, the progress in weight depending more upon the feeding and condition of the dispetive organs than upon the tuberculous process. In the early stage of the disease, wasting is especially suggestive when it continues without apparent cause after measles or pertuesis, or when it percents under other circumstances in spite of a good appetite and apparently good digestion. It may at first be so slight as not to be noticed unless the scales are employed. In obscure cases this steady loss of weight is a point of much

disgnostic value, and is frequently overlooked. Toward the close of the disease there is rapid and frequently extreme emaciation.

Cough is almost invariably present; it may be hard, dry, or suppressed; it sometimes occurs in paroxysms resembling pertussis, which may or may not depend upon the presence of enlarged temetical glands.

Expectoration is absent in infants, the material coughed up being smallewed. In children over seven years old there often is a profuse anco-puralent expectoration, but it is very exceptional below this age.

Hemophysis is a rare symptom, but not unknown even in young children. Henoch has reported a case of fetal hemophysis in a child ten menths obl, where the homorrhage was due to the rupture of an anorrism in the wall of a cavity. Here, in 247 climical cases of inherentosis in children, records 8 of hemophysis—4 of them in children under five years, and the youngest only eighteen menths old. The records of 131 autopoics on tuberculous children in the Pendlebury Hospital show that hemophysis was four times a cause of death; two of these patients were under five years, and one was only twelve mouths old. We have never not with a case of hemophysis in a child under five years old.

The respiration is accelerated, and usually out of proportion to the rise in temperature. As the lung becomes more and more extensively invaded there is constant dysphon. The pulse is rapid in the early stage, and continues so throughout the disease; toward the end it becomes weak and irregular.

Plearitic pains in the chest are not frequent in shidten. Gustrointestinal symptoms, such as indigestion, comiting, diarrhea, etc., are generally present, but are not peculiar to this disease. They usually depend upon the petient's general condition, only exceptionally upon tuberculous disease of the stomach or intestines. The characteristic symptoms of intestinal tuberculosis—abdominal pain, tenderness, uncontrollable diarrhea, and intestinal homorrhage—are soldon met with in children under five years. Careful palpation of the abdomen may fuctor the presence of enlarged inescatoric glands. When these are not readily felt through the abdominal walls, they may semetimes be discovered by a rectal examination.

The spheen is often enlarged, semetimes very much so, but this does not occur with sufficient frequency to be of much diagnostic value. It may be due to tuberculous deposits, to causes connected with the languar heart, or to favor. The liver is not often enlarged from tuberculous deposits, but may be so from amybrid or fatty degeneration, or from outracted circulation, as in the case of the spheen.

Dropsy is rare. It may depend upon anemia, upon complicating nephritis, especially anythid degeneration, upon cardiac or pulmonary tonditions leading to interference with the return circulation, or upon pressure of tuberculous retroperitoncal or mesenteric glands upon the inferior sena cava. Clubbing of the fingers is occasionally seen in cases running a very protracted course.

Anemia is commonly associated with wasting, and it is of special importance when the latter is slight or about. It is a frequent segrel of acute disease in infancy when not dependent on telesculosis; when, however, it is associated with low fever, cough, and persistence of riles in the chest, it should excite apprehension.

CHRONCE Transcribers Programma.—In young children this is a chronic interstitial pneumonia associated with tuborculous deposits. These cases have usually had their beginning in one of the sends frems. There is a slow convalencement apparent recovery, although this is not complete. Often a slight cough remains, or returns from the slightest exposure or other exciting cause. The child does not regain his former weight or vigor, and careful examination of the lungs shows that some abnormal signs remain.

After a few months, possibly, the child has another attack resembling the first. It is accompanied by fewer, cough, and perhaps there is a fresh exceolidation of some part of the lung, generally in the neighborbood of the old disease. All active symptoms finally subside, and must of the signs of recent disease disappear; but it is then usually found that the condition of the lung is not quite so good as before this around illness. The acute attacks may be repeated several times and pass under the name of bronchitis, bronchoporumous, or pleurisy. They may extend now a period of years. The general health in the internal is not good, there being present in most cases aremais, with the usual symptoms of malautrition; these children are regarded as very delimit.

The course of this disease thus differs in no essential particulars from that of simple chronic brouchspacemount; the physical signs likewise are identical in character, although they may differ in their location. They are generally found in the same conditions as are the signs in the more rapid forms of pulmomery tuberculosis in early shifdhood. A fatal result in these cases is neually brought about by the development of acute tuberculous passumonia or unitary tuberculosis of the lungs, by tuberculous meningitis, or by a simple brouchspacemounia.

Parsocal Soxs or Person our Transcrious.—Speaking generally, except in situation there is little difference in a young child between the signs of a benerhitis or benerhopseumonia due to the tuberde builder, and those of the same lessons when due to other causes. Cavities, although present at autopsy in most of the advanced cases, are seldent of such size or so eiterated as to be recognized during life. In children over six or seven years old, the signs are essentially like those in adults.

The upper lobes are the sent of the most advanced disease twice as

frequently as the lower labes, and the right long rather more frequently than the left. The region most often involved is the middle zone of the lang. If the signs appear first behind they are usually in the intersupular space; if in the lateral part of the clast, they are in the middle or apper part of the axilla; if in front, they are in the mammary region. The explanation is found in the fact that the disease in infants and young children so often extends from the lymph nodes at the root of the ting to the long itself. The physical signs themselves may be grouped under four heads, corresponding to the pathological conditions existing in the disease, viz., (1) brenchitis; (2) partial consolidation; (3) complete consolidation; (4) excavation. The early signs are almost identical with those described in branchopneumonia. As a rule, however, the transition of the signs from one stage to another is much slower in tubercalous than in simple because presuments.

Taberculous bronchitis gives rates which may be of all sizes and surieties, localized or general. If the process gow on to a partial consolidation there are gradually developed in addition slightly impaired resonance or even delines, homehoresicular requiration, and increased twice. These signs are usually over a localized area. Later the signs of complete consolidation are present—marked duliness, increased fremitus, bronchial respiration, and voice,—but still rates and friction sounds are generally heard.

The later signs depend upon what course the pathological process follows. If it terminates in a diffuse or localized cascation, the signs differ little from those of a lober presumonia with extensive and complete consolidation except that the dulness on percussion is usually greater. There may be even flatness on marked as to suggest the presence of a plearal effusion. Empyona is the diagnosis often mode. These signs may persist until the death of the patient from exhaustion.

If the ensention is localized and followed by excavation, the signs of a cavity may be present. Cavities, however, are often so small and deeply scated as not to give definite physical signs. Furthermore, they are frequently filled with thick pas or chessy matter, and rarely communicate freely with the broachi. If large and superficial they give the same signs as in adults. Like the areas of tuberculous pneumonia, they are most frequent in the middle zone of the long in Iront or laterally. In the young child similar signs are aften present when there are only dilated branchi associated with a fibroid condition, or when a superficial branchus is surrounded by an area of diffuse cascation. Cavities are very aften diagnosticated when they do not exist, and quite as often overlooked when present.

If the scute process terminates in a chronic tuberculous pneumonia the signs are those of an unresolved or slowly resolving pneumonia, in which the area of consolidation gradually diministes, but the signs do not altogether disappear. When recovery goes further these may remain only some dulness on percension, brunchorescular respiration, râles, and friction seands. Such signs may last indefinitely, exacurbations and remissions occurring from time to time. These signs can not be distinguished from those of simple chronic bronchopsesments.

DIMONOSIS OF PULMONARY TURRICHLOSIS.—The family history, surroundings and previous condition of the patient are important, also the mode of orset, the course of the disease, and the cyclence afforded by the physical examination. Not only should the health of the parents and other children be investigated, but that of other members of the household and frequent visitors. The occurrence of lone and joint disease as well as pulmonary disease should be considered. Surroundings favoring the development of tuberculosis are city residence, especially if in a transment house, or an institution. One should regard as important, habitual underweight, anomia and general malautrition. Of previous diseases in the patient the most significant are presumonia, mendes or pertusis with prolonged convalencence, and persistent or frequently recurring attacks of broughitis. In the milder or early cases the two important armutoms are cough and fever; the cough is more significant when persistent and accompanied by micopuralent experioration. Hemoptysis among chililren is so rare as to aid little in diagnosis. Fever, to be of diagnostic value, should be at least 99.5" E. in the mouth or 100.5" E. rectal for a considerable period, nemally several weeks. Wasting is important when present but its absence by no means excludes tuberculosis, since it depends more upon the condition of the digestive organs and the feeding than upon the local disease. Secuting is not a common symptom in children. The physical signs which are of especial diagnostic value are persistent localized riles anteriorly, either in the region of the nipples, or between the nipples and axillar, or at the spaces. To these signs should be added a positive can Pirquet reaction, which test should be repeated at least suce to avoid error. Additional information is cometimes afforded by the X-ray evamenation, though the plates need to be interpreted by one with truck experience. These findings are always to be taken in conjunction with physical signs and rational symptoms,

In the more scate or more advanced cases, taberculosis has to be distinguished chiefly from simple branchopnessessis. The easet of simple passumonia is usually rapid, often abrupt; taberculous passumonia usually develops more gradually. Constitutional symptoms may precede the local ones by several days or even weeks. In tuberculous one is often struck by the disproportion between the general symptoms and the physical signs. One may see with taberculosis, rapid wasting, prostration, cough and high fever with physical signs which are few, irregular and inconstant. Again strongly suggestive of tuberculous are very extensive physical signs, especially persistent generalized fine rides without consultdation, accompanied by severe dyspaces, even cyanosis, and yet with a temperature only moderately elevated.

The course of the temperature can not be depended upon in diagnosis. A high leacecyte count, e. g., alone 25,000, especially when accompanied by a high polymorphomodest percentage, strongly favors pneumonia. The X-ray examination is often of more value in these than in the less acute cases. The extaneous titherculin test gives positive results in nearly all cases except those which are extremely prostrated. Meningitis developing during a pulmonary disease of dealetful character is generally tuberculous. But acute pneumococcus meningitis assy occur in very similar circumstances.

Branchestica for Bacilli.—Discovery of the baconi in the spetum is of course conclusive and is by no means so difficult, even with very small patients, as has been supposed; but in most cases repeated examinations are necessary. Infants do not expectionate, but cough up the branchial secretion into the pharynx and swallow it. Sputum must therefore usually be obtained from the pharynx. To abtain the sputum in an infant one should exests a cough by irritating the pharynx, and then eath upon a small swall the sputum brought up into view. By the procedure mentioned it is not usually more difficult to obtain good sputum in very young patients than in adults. But ill are seldon found in clear, glairy muons, but in microparalent masses. Following the method described, backli have been found in the great majority of our bospital cases of pulmonary tuberculosis in infants, although in more than half of them the discove was not advanced, judging by symptoms and physical signs.

Burilli may readily be found in the stools of many children suffering from inherentosis. Their presence does not necessarily indicate a inherralism lesson of the intestines, for their source is more frequently a pulmenary lesson, the burilli being coughed up and evallowed. Hence, it is sometimes easier to find them in the stools than in the sputum. They must be carefully differentiated from the energina bacilli.

III. Chronic Phthisis.—This form of tuberculosis, with its chronic bactic fever, slow envity-formation, progressive emaciation, night sweats, etc., is very rarely seen before the fifth year, and it is not at all frequent until the teach or twelfth year. In its symptoms, course, termination, and physical signs, it resembles the same disease in adults, and need not be described at length here.

IV. Teberenlesis of the Bronchial Lymph Nodes (Bronchial Glands).
—This condition is usually associated with some form of pulmonary teberculosis, but it may exist as altogether the most important tuber-rulous lesion.

The symptoms are usually associated with those of pulmonary or general interculous; but they may occur when the pulmonary changes are too few to be recognized either by symptoms or physical signs. From the great frequency with which this testes is found in infants and young children, it might be expected that local symptoms would be common in such patients. They are, however, in our experience, quits exceptional Most of the cases in which well-marked symptoms occur are in children over two years old, and it is between the third and tenth years that they are usually seen. In infancy, death in most cases occurs from the pulmonary disease.

General symptoms may or may not precede the local ones. The latter are chiefly mechanical, and depend upon the size of the glands and upon their analomical relations, and very little or not at all upon the nature of the changes in them. The most important relations, so far as the production of symptoms is concerned, are those which they bear to the presumognetric and tecurrent laryngeal nerves, the superior tems cava, the trackes, and brancha; those less important are to the aceta,

pulmonary artery, and esophagus,

Pressure upon or irritation of the pneumogastric or recurrent nerves produces cough, dyspace, and sometimes a change in the voice. The cough is hourse, persistent, and teasing, and frequently occurs in puroxysms which in many respects resemble those of pertussis, but it usually basis the characteristic whoop, and is not accompanied by the expectoration of a mass of tenscious mures. These puroxysms are severe and often prolonged. The dyspace, like the rough, is paroxysmal, and sensetimes strongly resembles ordinary spannedic croup; at other times it is like a severe attack of asthma. Such symptoms may come and go, but they are frequently prolonged, and neually in the interval between the severe somes the patient is not wholly free from dyspace. Although the chief cause of dyspace is no doubt nerve irritation, it may be due in part to pressure upon the traches or one of the large brouchi. In dyspace from pressure on the traches or one of the large brouchi. In dyspace from pressure on the traches the head is usually thrown back, and the obstruction is more frequently on expiration than on inspiration.

After such symptoms as those mentioned have existed for a few days or weeks, and in some cases without any warning, there may occur a sudden attack of asphyxia which may prove fatal. This is generally due to obseration of a caseous gland into the traches or a large broachus and the escape of a large mass into the air possages, where it produces the

same effects as does any other foreign body.

Of fifteen cases of this kind collected by Leeb, death by sufficient occurred in most in from five to ben minutes after the first definite symptoms; in some the fatal attack was preceded for some time by milder attacks or by a cough; in others no previous symptoms were present,

the child being apparently in perfect health. Barely after ulceration into the traches the patient has recovered after coughing up a large amount of pus.

Pressure upon the superior vena cava is usually associated with spasmodic dyspnea and cough, and causes cyanosis of the face and blueness of the lips. There is frequently a puffiness of the face, and there may be marked edema. The coexistence of evanosis with such edema, when the urine is free from signs of repal disease, should always lead one to suspect pressure at the root of the lang. In some rare cases the interference with the return circulation has been so marked that meningeal benorrhage has resulted. By a process of alteration set up in these glands they may open, not only into the air passages, but into the pericardium, the esoplague, or any of the large result. The last mentioned is usually followed by instant death. Ablibert reports two cases in which the pulmonary artery was opened, death occurring from hemophysis, as there was also a communication with one of the large broachi. In Vogel's case the subclavian vein was perforated, and death resulted from the entrance of air. If alteration takes place into the surrounding connective tissue, a mediastinal abscess may result, producing any of the pressure symptoms noted above, and, in addition, dysplagin from pressure on the exoplugue. Such an alocos may point in the suprasternal notch; it may open through the chest anteriorly between the ribs or at the xiphoid cartilago; or it may burrow along the escobague to the peritoneal cavity. As a rule, however, patients die of general tuberenlosis before the local conditions have advanced so far.

Physical Signs.-In order to produce signs the mass of lymph nodes must be large enough to form a considerable mediastical tumor, or he so situated as to produce pressure upon the traches or bronchi. Only large packets of glands can be made out by physical signs. The large masses may give dulness over the first piece of the sternum, or, more frequently, behind in the interespolar space, usually between the third and seventh dersal vertebras. Normally, whispered bronchophony usually ceases at or just below the level of the fourth dorsal vertebra. When it extends below this point it is suggestive of enlarged bronchial glassls (D'Espine's sign). It is usually more marked upon the right than the left side. There may be also soice and breathing of a somewhat amphoric but with a distinctly nasal quality. The signs are sometimes indistinguishable from those heard over a small cavity. Taken in connection with a positive estaneous Inherculin test and X-ray findings, these signs are of much significance. If one of the primary bronchi or one of its lobar divisions is compressed, then may be very feeble respiration over one lung or one lobe; if the pressure is sufficient to prevent the entrance of air, or if one of these large tubes has been plugged by a caseous mass, there is an alsence of

respiratory murmur over a single labe or an entire lung. This sign is of great diagnostic value, but it is not often present.

Diegonois.—Mediastical glandsfor tamore may occur in Hodgkin's disease and in malignant disease; but both are relatively very rare and usually present other diagnostic symptoms. Practically, in almost every case, marked sulargement of the broughtal glands is due to tuberculous. The only really trustworthy means of diagnosis in most cases is afforded by the X-ray, though considerable experience is requisite in the interpretation of the plates; the rediographic shades usually shows better



Fig. 160.—Tensemptons Bacocatta, Galappe. A very large mass upon the right side, A, A, a resulter one upon the left side, B, B.

on the right sole than on the left on account of the heart (Fig. 180). Especially significant are evidences of soleification, which may be found even in very young children. (We have natopey records of such changes in infants only seven months old.) More stress is in some cases to be hald upon symptoms than physical signs for diagnosis; the most important symptoms are the association of a spannodic cough with perception of dyspon resembling asthma or crosp and severe congestion of ederm of the face. The chief difficulty in diagnosis is found in those cases which present few or no other signs of tuberculosis, and which come first under observation with attacks of dyspose or asphysia resembling those seen in larguppal stenoors. In many such cases trachectomy has been done without finding any cause for the dyspose, the autopsy

showing it to be due to the observation and impaction of a caseous gland.

The development in a child of a chronic abovess in the anterior mediastinum is almost always due to inherenfous glands; and so is one in the
posterior mediastinum, provided Potr's disease can be excluded.

The Tuberculin Tests.—For general diagnostic use in children von Pirquet's cutameous test as so far superior to the other tests suggested that only this need be considered in detail.

The forearm is the most convenient part for applying the test. The skin is carefully washed with alcohol or other. A small drop of pure tuberculin (Koch's O.T.) is placed upon the skin. With an instrument resembling a tiny chisel a very slight scarification for control is made at a distance of two or three inches from this drop. A similar scanification is then made through the drop. Linear scratches one-quarter inch in length lightly made with a sterile needle, serve equally well as a means of insculation and control. The child should be watched, and if very young the arm should be held until the skin is quite dry to prevent infection by rubbing. As an added permution it may be covered with a piece of sterile game. The reaction comests in a red arcola about the point or along the scratch made. This generally begins in from twelve to eighteen bours, rarely later than twenty-four hours, and reaches its height during the next trenty-four hours. The size of the arcola indicates the degree of reaction. It continues in most cases for from one to three days and slowly fades, often being followed by a slight local desquareation. Rarely there may be vesiculation. There is in most of the cases slight induration of the skin readily appreciable to the touch, The more marked reactions continue for from four to ten days. Any definite inflammatory reaction which follows this ourse may be regarded as positive. The arm should be observed fluily to note the results. There soms to be no relation between the intensity of the reaction and the entent or the activity of the tuberculous discuss.

The Significance of the Tuberculus Test.—The cutaneous test gives positive evidence if tuberculosis is present, in all except the most prostrated cases and those in the late stages of the disease, when diagnosis is rarely difficult from the other symptoms. Exceptions are, in our appriance, extremely rare. Much importance is therefore to be attached to a negative reaction. For greater certainty the tast should be repeated in suspicious cases. The interpretation of a positive reaction is much modified by the age of the patient. Under one year a positive reaction usually indicates an active tuberculous process. Many have even taken the ground that an infant under one year with a positive reaction is decened. We do not think the outlook quite so hopeless; but such a contion is certainly of grave import. During the second year a positive reaction is not so serious; it is often seen in infants who have not at the

time and do not develop active tuberculosis. After infancy the test becomes less and less an indication of an active inherculosis and the interpretation of a positive reaction is more difficult. It is always to be taken in conjunction with the clinical symptoms. A negative reaction with clinical symptoms suggestive of tuberculosis is always to be regarded as significant. It almost certainly excludes tuberenlosis except in conditions of extreme posstration. Great difficulty may exist in the interpostation of a positive reaction under two conditions. The first is in an argumently bealthy child with a prolonged unexplained temperature but no physical signs of pulmonary disease. In such circumstances the existence of active tuberculous is probable after other conditions have been variated. The X-ray may shed light upon the case. The second condition includes the cases in which acute pulmonary disease is present in a patient who gives a positive reaction. The course and berminution of the disease may ultimately establish the fact that the process in the lung was non-tuberculous. But because of the positive reaction grave suspicion of tuberculosis may exist. Much needless alarm may therefore be excited by a positive reaction, which really demonstrates only that the child has somewhere a tuberculous focus, but does not prove the existing disease to be a tuberculous process. The tuberculin reaction is always to be interpreted in conjunction with the general symptoms and the physical signs. As a rule, in older children a negative reaction is of more significance than a positive one. During active measles the test can not always he relied upon.

The tuberculin test should not be allowed to displace the examination for bacilli either in the sputum or cerebrospinal fluid, though the latter involves much more labor. The positive reaction furnishes reliable evidence of the existence of a tuberculous process, but as to whether this is

active or labent gives no information,

Tuberenlides of the Skin.—These are at times of considerable value in the diagnosis of general tuberculosis. Although seldom seen in the most acute turistics, they are not uncommon in the more alonly progressing forms. The distribution of the lesions is fairly constant. They are found chiefly on the buttocks, lower abdomen, genitalin and thighs. The number present is generally small, half a dozen to a dozen; but they are sometimes numerous and may be widely distributed. The lesion consewhat resembles that of varicella. It begins as a minute religious consewhat resembles that of varicella. It begins as a minute religious, which is seen surmounted by a small vesicle. This dries to form a crust. If the crust is removed a small pit-like depression remains which heals quickly, leaving a white, glistening sour surrounded by a pigmented border. The lesion runs its entire course in two or three weeks. Tubercle bacilli are often present in the lesions but are difficult to demonstrate. Tuberculides of the skin in young children are evidence

of a widely disseminated process and are a very bad prognostic sign. Such patients turely survive more than a few weeks.

General Progness of Tuberculosis.—The surface for a child under two years with general or palmenary teherculosis is very laid. So long as the disease remains confined to the lymph nodes, the child is not usually in danger, except from accidents remocied with their softening and alceration, which after all are rare. Spontaneous cure may seem in these glands in the same way as in others in the body, vin, by emagsulation, calcification, etc. Such a result is no doubt a very frequent one; exactly how often it occurs it is impossible to say; but when once the disease has gained any headway in the lung itself, its steady advance is almost certain to be the course in a young child. In those who are older and have more resistance the chances of an arrest of the process are much greater.

If the lacilli have gained entrance into the body in any considerable numbers, even though they are shut up in an encapsulated, enseems, broachial gland, the patient is zeroer free from the danger of general

indection.

Prophylaxis.—The prevention of tuberculosis must have constant referrore to its ranse. The first essential is the destruction of the tollerelebeeilli wherever they exist. Since most of those existing in the nir are derived from the sputum of patients affected with pulmonary tuberculosis, it should be insisted upon, everywhere and at all times, that the sputum from such cases should be collected in special cups or cloths and destroyed either by germicides or by firs. The next point is to avoid needless exposure. A inherenteus mother should on no account nume her child nor kiss it upon the mouth. A wet-nurse likewise should be free from my tuberculous laint. No nurse or other care-taker should ever be employed about children who has, or ever has had, polinsoury taberrulasis. It is wise to exclude also those who suffered when children from tulerculosis of the bones or the cervical glands, although the danger from each persons is extremely slight. If active tulerenlosis exists in say member of the family, a young child should be kept away from the room, and if possible should not reside in the house. On no account should infected persons be allowed to kiss children or sleep in the same bed with them. The danger from drinking-cups and other dishes should not be forgotten. A tuberculous person should either have his special dishes, or the utmost care should be taken to boil all those which he has used. Cowe whose milk is used for children should be under regular teterinary inspection and should have passed the tuberculin test. In any case when the slightest doubt regarding the health of the cows exists, or when the source of the milk is unknown, the milk should be pasteurized. The dancer of infection through the alimentary canal is very much less. than through the respiratory tract, and consequently the premutions first mentioned are much more supertant than those relating to the food, although the latter should on no account to neglected.

In the case of delicate children and those with tuberculous parents or with other tuberculoss near relatives, everything possible should be dean to fortify them against the disease. They should be kept under more or less constant medical supervision. Attacks of bronchitis or bronchesenermonia should be watched with the greatest solicitude. Exposure to influence, meades or pertuous should especially be avoided. The comtry rather than the city should be chosen for residence, and the child should, if peoilde, spend the winter and spring in some warm, dry climate. Parents should be distinctly taught that watchfalness and care da not mean coddling or the locoling of children in the house the greater park of the time. Such children should live as much as possible in the open air, and every form of sport encouraged which tends to keep them there. Overheated houses are one of the most prolific agencies in perpetualing a delicate condition of health. Plenty of fresh air in electing spartments should always be invisted upon. All estarchal troubles of the nose and pharyax should receive early and prompt attention, especially should hypertrophical tonsile and adenoid growths of the pharynx be removed, since these are conditions which form a most favorable nidus for the growth of tubercle bacilli,

Treatment of General and Pulmonary Tuberculous.—If fresh air and a proper climate are necessary for the cure of this disease in adults, they are teufold more necessary in the case of children. Without them there is little hope for a child with active pulmonary tuberculous. Nowhere do these cases do so budly as in a hospital located in a city, and no class of hospital cases do worse than those. The same regions that are beneficial for adult cases nearly agree with children, with the exception that the latter, as a rule, do better in a warm than in a cold climate. Plenty of fresh air and sunshine are essential. A child must be where he can be kept in the open air for the greater part of each day, in spite of fever, rough, or other acute symptoms.

For the most acute cases when the children are confined to the led, the largest, best-ventilated, and sunniest room available should be accured, and the windows should be constantly open. The general management of such cases is the same as for those with acute presuments.

There is no specific remedy for taberculosis. The diet is a matter of the atmost importance. Taberculous patients must be fed like most other sick children, care being taken not to disturb the digestion by the unnecessary use of drugs. For a staple article of diet, milk is the best and when this is not well borne some of its substitutes—butternilk, kumpes, rootak, etc.—may be tried. Creap is almost as useful as codnear oil, and should be given in one form or another whenever the

Tuberculin in the freatment of this disease in young children has been most disappointing in its results. Its value has not yet been demonstrated. There always exists the possibility of lighting up a latent process in the lungs. It should be given with the greatest caution in active febrile cases. The method of using it is discussed under the treatment of Tuberculcus Adenitis.

Cod-liver oil is usually best given in a fresh emulsion, although some children hear the pure oil better than its perpurations. Immedians of this or other oils are of some value when not well tolerated by the stomgals. Arsenic and iron are useful as general tonics.

CHAPTER XI

BYFHILIS

Stricted policy of Schaulers, In acquired syphilis this is found in the primary below, in the maccus patches and in the lymph nodes. In hereditary syphilis it is found in the entaneous belows, in the figures at the angle of the mouth and in the maccus patches of the buccal races, with less regularity in the internal organs, except the liver, which smally harbors the organism in immense numbers. While in the stilltern child and in early cases, the number of organisms found is very great, they are not so numerous at a later period, and they diminish rapidly after treatment is begun. In the late become the spirochetae are not numerous, and are difficult to demonstrate.

In infancy and childhood both the acquired and the hereditary forms of applitis are seen.

ACQUIRED SYPHILIS

While acquired syphilis is very much less frequent than the hereditary variety, it is by no means a very rare disease in early life. It is not improbable that some of the manifestations of syphilis in later childhood which are usually denominated "late hereditary syphilis," are really due to the acquired form.

Etislegy.—An infant may be infected by the mother during parenritian; but this is extremely rare and can take place only when there are become upon the mether's genitals. Infection is more likely to be from a mother who contracts appliins subsequent to the birth of the child, and may occur through nursing or accidental contact by kissing, etc. In either of these ways, or from a concreal sore upon the nipple, a child may be infected by a wet-nurse. Whether appliins can be communicated through the milk when the nipple is perfectly healthy and free from fissures, is exceedingly doubtful.

Syphilis may be communicated directly from a syphilitic shift to one who is healthy, by kissing, by sexual contact, or indirectly by means of bottles, spoons, cope, clothing, etc. The latter mode of infertion is must likely to occur in institutions. Vaccination was formerly a not infrequent mode of communicating syphilis, but has been practically eliminated by the general introduction of busine surus. Cases have been researched where the disease has been conveyed by the rite of circumcision, eather from the mouth or the instruments of the operator.

The relative frequency of the different sources of infection is shown by Fournier's statistics of 40 cases: The source of infection was the parents in 19; nurses, in 8; servants, in 4; sexual contact, in 4; vaccination, in 2; other children, in 2; a physician, in 1. The ages at which the disease was acquired in this arries of cases were as follows: During the first year, 19; during the second year, 10; during the third and fourth years, 7; from the fifth to the fourteenth year, 6.

Symptoms.—The symptoms of acquired syphilis in children are in all respects similar to the same disease in the adult. A primary sure is present at the site of infection, which is most frequently the lips, the mosth, or some part of the face; very tarely is it seen on the gentials. There are few individual symptoms belonging to hereditary syphilis which may not also be present when the disease is acquired. Its course, however, is very much milder in the latter and a fatal termination is non-Fournier states that of his forty-two cases only one died of marasmus. This marked contract to hereditary syphilis is due chiefly to the fact that in the acquired variety the infant is rarely infected during the only months of life, a time when beneditary syphilis is so fatal.

Tertiary symptoms may appear at any time from these to twenty years after the original infection.

The treatment is the same as that of hereditary syphilis.

HEREDITARY SYPHILIS

Etiology.—If both parents are syphilitic, the shild is usually but not invariably so. The symptoms, however, are not more severe than when the inheritance is from one purent only. The likelihood of transmission depends upon the stage of the disease in the parents. If the mether is suffering from secondary symptoms, transmission is almost certain. If active treatment has been employed for several months, if the child is tern at a period when no active symptoms are present, or if the symptoms are of a tertizary character, the offspring will probably escape. First-born children are more likely to suffer severely from syphilis than the later size, provided infection of the parents has taken place prior to the hirth of all the children.

The transmission of syphilis from the father without the intermediate infection of the mother was once held to be not only possible but frequent. At the present time, however, this question must be placed among these not yet definitely settled. There can be no doubt that in the vast majority of the cases the infection of the child is from the mother.

If both parents are healthy at the time of conception and the mother becomes infected during her pregnancy the child may or may not be syphilitie. Transmission to the child is much less likely to occur if the mother is infected during the last two months of her pregnancy than earlier, although, as Hutchinson's cases conclusively show, there is no certainty that the child will escape. Diday states that if the mother is infected before the fourth work and proper treatment is instituted, the child will neually escape on account of the relation of the embryo to the maternal circulation during this early period.

In 1837 Colles councisted the following proposition, the truth of which has been abundantly verified since his time; "A new-bern child afferted with inherited syphilia, even although it may have symptoms in the mouth, never causes alceration of the beauts which it sucks if it be the mother who sackles it, although continuing capable of infecting a strange nurse." From the careful analysis of many cases and with the great assistance derived from the Wassermann reaction the conclusion seems irresistible that the mother who hears a syphilitic child is immune to syphilis for the reason that she herself is suffering from syphilis, or a modification of that disease. The mother in those circumstances can not be inocalated either by her syphilitic nursing infant or artificially.

That hereditary syphilis is contagious is conclusively shown by a number of recorded instances in which a healthy wet-nurse has been infected by a syphilitic infant. We have ourselves seen one such instance. However, such examples of contagion are rare, and many writers of large experience state that they have never seen it. It is certainly true that the danger of spreading infection from a case of hereditary syphilis has loon exargemented.

Lesions.—Death may occur with apphilis, and yet the autopsy may reveal no characteristic anatomical changes, and in fact there may be to demonstrable changes in any of the organs except the presence of the sprechetae. This is particularly true of infants dying in the first weeks of life.

Boxes.-In the case of a syphilitic fetus, a still-form child, or one dying seen after birth, the changes in the hours are more uniformly present than are any other bosons. They are, in fact, rarely wunting, and it is by them alone that syphilis is often recognized post morton, but it may require a microscopical examination to establish the diagnosis. The long bones are principally affected, the most suportant charges being found at the function of the shaft with the spinhweal cartilage. The lesion is termed an epiphyseal osteochondritis. There are two varieties! in one there is an inhibition of bone formation around the columns of calcified cartilage, though the destruction of eartilage cells by the vescel loops and the formation of hone marrow goes on unchecked and in a normal manner. In the other, there is, in addition to the delay in bone formation, the development of granulation tissue that aprings from the cartilage canals and that grows between the shaft and the epiphysis, and, perferating the column of cartilage cells, invades the couplesis. The granulation tissue may grow so hoursantly as to separate the epiphysis from the shaft and in either case the bone is so weakened at the eniphyseal line that fracture through it readily takes place as the result of slight fraumation, either in intra-uterize life or after birth. Thus results separation of the epiphysis, a frequent manifestation of severe hereditary exphilis. With either form of esteechondritis there is a bound yellow line to be made out macroscopically at the junction of the spiphysis and shaft; with the excessive formation of granulation tissue and the invasion of the epiphysis the line - an irregular one.

While the sensors changes are widely distributed throughout the body they are not of equal intensity. The lower end of the femur and radius and the upper end of the tibin and humerus are most severely affected. Complete recovery from the lesion is possible. Acute suppurative spiphysitis and arthritis may occur in syphilis but they are to be regarded as

of pyemic rather than of syphilitic origin.

Osteoperiostitis is common in hereditary syphilis. In young infants it is found as a very generalized lesion, affecting the shafts of the long hones, especially those of the leg, forearm, and hands. The swelling is nearly at the end of the shaft. With increasing age the tendency is to involve the shaft nearer its middle. The lesion in infants is largely periosteal. Later the hone participates more and more in the process; there is a formation of new ione which is firm and very compact or it may consist of a coarsely spongy structure. The periosical swellings with appropriate treatment may entirely disappear by absorption. The new-formed bone largely persists.

Gummata of the bones are rare in infancy. With older children gummata may form on the long bones or the skull. They are not confi-

tially different from those occurring with assuized apphilis.

Liner.—This is probably more frequently involved in the fetus and newly-born infant than any other organ. The syphilitic lesions of the liver consist in an interstitial hepatitis, a gummatans hepatitis, or a constination of the two varieties. In the interstitial form, which is most frequent in infancy, the liver is enlarged, frequently very much so, and firm. On cross section the markings are industract. Microscopically, there is a great increase in connective tissue which is diffusely scattered throughout the whole organ and even between the individual liver cells. There may be also bands of connective tissue involving the liver in different directions. As the connective tissue contracts an irregularity of the surface of the liver develops. Groups of miliary syphilomata may also be found.

The gummatous form is not frequent in early infancy, but belongs to a little later period. In this there may be miliary syphilomata with interstitial changes, and in addition the formation of small or large gummatous tumors which may be softened at the center. They are surrounded by somes of new connective tissue and the liver cells are atcaption. Amyloid changes may be present.

In the late form of hereditary apphilis, usually used in children over four or five years old, the liver is occusionally affected. The lesions resemble these of the congenital carriety. There are found circletic changes, which may be define to circumscrabed, and gummatous deposits, which vary from a minute size to that of a cherry; there may be amyloid degeneration.

Spleas.—This is almost invariably much calarged in newly-born childien with syphilis and in syphilitic fetuses, but nothing characteristic is lound under the microscope. In older children the enlargement of the spleas may be even greater. The organ may be the sent of interstitial changes, and sometimes there may be small guarantees deposits. These changes are rare in children under two years of age.

Bespirelary System.—In syphilitic infants who are still-born and in these who die soon after birth, there is occasionally found in the lungs what is known as "white pneumonia." The lungs are nearly white or slightly red. They are firm and contain little or no air. The alwedi are filled with desquaranted cells and lessewytes. There is an increase in the consective tissue of the alweolar walls, brough, and blood vessels. There may also be gummata scattered through the lungs. These are usually small.

The trackes and branchi are in rare cases the seat of stenosis, which results from electrization following the softening of governatous deposits in their walls. Lecions of the laryax other than a chronic catarrhal inlarmation of the mucous membrane, are also infrequent. The lesion results found is perichondritis, which more often involves the gradients. than any other part. Sometimes there is the formation of papillomatons masses; but ulceration and stemses are both rare.

The mosal nuccous membrane in the early stage of the disease is very constantly the sext of a chronic catarrial inflammation, which may be accompanied by superficial alcoration. In the late cases there is deeper alcoration, from the becaking down of generate, with extension to the periosterm, cartilages, and lanes, ransing perforation of the septum, necross of the bones, etc.

Nerrous System.—Syphilis may affect the meninger, the blood unasis or the brain itself. There may be merely a diffuse thickening of the
meninges with which there is usually associated a certain amount of
encephalitis, or there may be miliary gammata scattered throughout the
meninges but especially at the base. As the result of the chronic syphibitic meningitis, adhesions may form at the base, obliterating the formen of Magendie and at times leading to hydrocephalus. Syphilitic endarteritis is very common and consists in a thickening of the tessel
wall with proliferation of the intima and reduction in the caliber of the
ressel. There is also a perivacular proliferation of remarking tisens.

The changes that have been described are found in direct proportion to
the severity of the syphilitic infection. In infants dying in ofers or
shortly after birth they are frequent. In those with a milli infertion, the
lesions may be slight or absent. Large gammata are unusual at any
time.

Later in childhood, syphilis of the brain is not very uncommon. The besions are chiefly the result of the vascular changes and consist in localized or diffuse aderois with greater or less atrophy of the convolutions. The lesions of jevenile pursues and takes do not differ from those that are the result of acquired syphilis.

Heart and Arteries.—These are very frequently affected, even in young infants. Adler, of four cases examined, found two in which wellmarked become were present in infants under four menths. Warthin has emphasized the importance of systematic study of the heart for exdences of syphilis. He has found besides and has demonstrated the organism when no other evidences of syphilis were to be found in the body. The lesions consist of a diffuse or localized interstitial myocarditis with endarteritis of the coronary arteries and small blood ressels.

Dipositive System.—Chronic cutarrhal pharmogitis is almost a constant symptom of the early cases. Later there is seen superficial or deep ulceration of the pharmax, tousils, or fances, which may lead to perforation of the soft or hard palate.

There are no frequent lessons of the stormels or intestines either with early or late syphilis. In infants dying early with very extensive lessons ulcerations are sometimes found in the small intestine. They are multiple and extend transversely across the intestine. They cause no symptoms. The rectum is occasionally the sent of ulceration, and condylomata may form about the axis even in young children.

Pancreas.—Changes in the panerous are frequent with severe infections; with mild infections they are usually absent. They consist in a diffuse production of resumetive tissue which replaces, to a greater or less extent, the parenchyms of the organ. In the most extreme cases there may be no glandular tissue remaining. The islands of Langerhans are usually not destroyed.

Thyoner.—Occasionally there are found in syphilis numerous small abscesses in the substance of the thyoner gland. They are filled with a purulent material consisting of leucocytes with great numbers of sporochtes. The glandular tissue is also infiltrated with henceytes. These abscesses of Duliois are very characteristic of syphilis.

Organs of Special Sense.—Otitis is a frequent accompaniment of the early syphilitic pharyngitis. It is very likely to become chronic, and in many cases results in a permanent impairment of hearing. Into is reintively care in children, but it may occur even in intra-uterine life, as shown by the presence of adhesions in newly-born children. It is usually seen in infants four or five months abl, and is always serious. Interstitual heratitis occurs frequently as a later manifestation of syphilis. Choroidata and optic neuritis are both accasionally seen, but they are rare.

Genito-winary Organs.—Nearly all these may be affected, but generally in the late period of the disease. There may be abronic interstitial apparitis and more rarely genumatous deposits in the kidney, interstitial changes in the apparenal bodies, and orchitis, which usually affects the body of the argan, rarely the opididymist at is generally an interstitial inflammation, with or without genumatous deposits.

Symptoms.—As the result of syphiles, abertion may take place at any period of pregnancy, with the discharge of a dead or maternated fictus, so the child may be still-horn at term, or it may be born alias promaturely, but with so feeble a vitality that it survives but a few hours. In these exemustances it is often difficult and sometimes impossible to decide positively with reference to the existence of syphiles. Materation of the fetus or poeling of the skin is no proof, and even the examination of the internal argums may not be conclusive, except for the presence of spirochetae. Lamer examined 63 fetuses, all dying before the thirtieth week of pregnancy; he found the spleen and liver enlarged in all, and marked home changes in \$1. Birch-Hirschfeld examined 108 newly-born syphilitic infants; he found the spleen invariably sularged; typical home changes were present in 35, but in many cases the homes were normal. More recent studies of the homes have shown them to be involved in a march larger proportion of cases than is given by these writers. Mervis,

from an examination of 92 syphilitic fetures, states that no eruption upon the skin was found earlier than the eighth menth.

Symptoms are present at hirth in only a small number of cases. In such there is usually a very severe degree of infection, and the infants do not often live more than a few days. Upon the skin there may be seen an eruption of pustules, papules, or bulbs. The bulbs are usually upon the seles and palms, but may be found upon other parts of the body. The name "syphilitie pemphigus" is aften given to this condition. The bulbs are at first small, then may coalesce and form larger ones two inches or more in diameter. They contain a turbod serum which is sometimes tinged with blood, and sometimes yellow from pas. Pustules, when present, are usually seen upon the face or scalp. The general appearance of these infants at wrest-teel in the extreme. The body is wasted, the skin wrankled, and temperature subnormal. The spicen is usually enlarged and often the liver also. Death usually occurs from immitten within two weeks.

In the great unifority of cases the infant appears healthy at hirth, and continues so for a variable time before the manifestation of the characteristic symptoms of apphilm. As a rule, the more intense the infection, the earlier the symptoms make their appearance. The earliest symptoms are generally seen between the second and the sixth works. If three months pass without exidence of apphilm, the probabilities are that the child will encape. Miller (Moscow) gives the following statistics of the time of beginning of symptoms in 1,000 cases:

Symptoms	appeared	during	the	first week	85	TENES.
			79	second week,	13%	(4)
A.		1.0	- 4	third week		
-	1.0			fourth week	177	
200	-	100	(A)	fifth week	86	
4	1.4	14	DA.	with work	84	16
		1.7	100	erenth week	60	
46		4		righth week	30	+
18	-	after		righth week	140	

Sometimes the constitutional symptoms—wasting, cacheria, etc.—are noticed before the local ones, but usually this is not the case. Generally the first symptom is the coryga or "souffes," which resembles an ordinary cold in the head, except that it percists. It is often accompanied by a boarse cry, indicating that the laryux participates in the catarrial inflammation. Such the eruption makes its appearance, being generally first seen upon the hands, feet, and face. Fiscures and muccus patches may be seen upon the lips, about the arms, and elsewhere. There is often slight fever, from 99° to 101° F. There may also be observed excentive tenderness and swelling about the shoulders, elbows, wrists, or ankles,

due to epiphysitis, which may cause the whilst to ery from the slightest amount of handling, and the limbs may be moved so little that paralysis is suspected.

In a severe case, as these local symptoms develop, the infant's general nutrition suffers. He loses steadily in weight, he becomes extremely anemic, and whines and Trets almost continually, but especially at night. The features have a pitiful, drawn expression; the face is wrinkled, giving the infant a very old appearance. The skin has a peculiar sallow color, which has been well described as rafe as last. The symptoms may continue until a condition of extreme mammans is reached, or death may occur from some intercurrent affection of the lungs or diges-

tive organs. Wasting is, however, very common in infants that are prenosture or very small at hirth. Earn without hereditary syphilis the question of marition is then a difficult one. Indirectly by causing prematurity, the syphilis is responsible. It is remarkable to see how well some children with extensive evidences of syphilis thrive, provided they were full-term infants and are breast fed.

In the milder forms of infection the severe constitational symptoms described are not seen, although the



Fig. 181.—Kenny Emprison or Hammers of Street, page. Indust two months old.

local evidences of disease are well marked. The severity of the symptomic also much modified by treatment, especially when this is begun only.

The most important local symptoms are the coryan eruption, fiscures about the mouth and arms, minorus patrices, painful aveilings at the extremities of the long benes, pseudoparalysis, and resychia.

Corga.—In most of the cases this is the first symptom. Beginning like an ordinary enterth, it is distinguished by its severity and its persistence. There is a copious discharge of muons and serum, often tinged with bland. Thick crusts form, which produce the usual symptoms of taked obstruction; there is great difficulty in nursing; the infant breathes through the month, and the muons membrane of the mouth is dry, causing great discomfort. If untreated, the process, which at first involvethe muccus mentions only, may extend to the submuccus tissue, causing alcoration; but the cartilages and the boace of the natal fosses are not often involved till a later period in the disease.

The most entert is associated with more or less laryugitis, causing heareness or aphonia, and rarely there may be laryugeal stensels. Dillog Brown has reported one case in an infant six weeks ald, which recorred after intubation.

Ecuption.—The early emption usually appears after the coryan has lasted about a week; but the two may come at the same time; or the



For 182-Easts Extremes or Biocontact Strenger, Salant too and me-ball nearlies and



Fig. 152.—Street, mr. Schools or two Food. From an infant eight weeks old.

coryza may be about ac so slight that the rash seems to be the first symptom.

Occasionally there is seen a diffuse blash or rescole, but usually the eruption is uncolar, occurring in small, dark-red spots about the size of the infant's fuger nails, usually circular and often slightly elevated; there is no surrounding inflammation, and no itching. It is usually most aluminat about the senter of the face, the extensor surfaces of the upper and lover extremities and especially the hands and feet. It may extend over the entire body, but is generally about over the chest and abdomen. At first the color is bright, but gradually becomes of a disky-red or expectly line. After a little time very line scales may be seen upon the serface of the red manufas. The rash corner out slowly, usually requiring from one to these weeks for its full development. It failes gradually, berning a coppery discoloration of the skin, which continues for a long time. The

duration of the eruption is from three to eight weeks; less if active frost-ment is employed.

A pupular eruption is rarely seen alone, but is usually associated with the mucular variety. The pupules are of a becomish color and are hard. They are seen most frequently upon the palma and soles.

A squamous eruption is frequently seen upon the pulms and soles, but not often elsewhere. In a few cases this scaliness forms the most distractive feature of the entaneous lesion (see Fig. 183).

Figures and Mucaus Patches.—Those are among the most diagnostic testures of early hereditary syphilis. Figures are most frequently seen on the lips and about the mass, but they may occur about the nestrils and oscalionally elsewhere. The fiscares of the lips are really linear ulcers, and are distinguished by their persistence in spite of local treatment.



Fac. 184. A Lavin Town or Reservoir of Reservoir Sweeten. Industryight months old.

They are multiple, deep, painful, and bleed easily. After healing, these facures may leave many cicatrices radiating from the mouth, the contraction of which produces the so-called "purec-string" deformity.

Museus patches may develop from fiscures, but more frequently from papules which are situated in regions where they are exposed to constant misture and friction. They are very common upon the marceutaneous surfaces and wherever the skin is especially thin. They are most apt to be seen about the lips, anus, scrotum, and vulsa, but they may also be found behind the sure, between the toes, in the folds of the green, axillae, or luttacks. They vary from an eighth to half an inch in diameter, are whitish in color, and are raised rather than eccuvated.

Ulters may be present upon any of the mucous membranes, frequently in the mouth or on the genitals; they are seldom symmetrical, and while they may be broad they are never deep.

Hemorrhages.—They are generally associated with the lexions of the miscons membranes, especially of the nose. In young infants with severe

infection, bleeding may occur from the bullons cruption open the skin, or from the fiscores at any of the scribes, particularly the mouth and areas. Fischl has reported seven cases of multiple hemorrhages in the newly born, associated with other symptoms of rengenital applicits. Mracek noted hemorrhages in thirty-three per cent of 160 autopaies on syphilitic still-born infants or those dying suon after birth. Examination of the blood-woods in some of these cases showed infiltration of their walls and narrowing of their lumen. The vascular changes were thought to be the cause of the blooding.

Nails.—The nails present several peculiarities in application infants.

There may be a disease of the matrix resulting in supportation and exlectation of the nail; frequently the dorson is much arched, and the nail
appears as if it had been pinched by a pair of forceps—t. e., clau-shaped;
this is an early symptom of some diagnostic importance. The hair and
sychrons frequently fall out completely. This symptom is not usually
present in very early infancy.

Prendoparatoris.- This is due to acute spophysitis, and it may be the first emptom of here-litary exphilis to attract attention. It is morally noticed when the infant is a few weeks old, that one or more extremities is not moved, and that the parts are tender when handled. The limb lies perfectly motionless, and any attempt at passive mensment courses evident pain. A history will usually be obtained that the loss of power-did not exist at hirth but developed subsequently. If the arm is affected it is very frequently bold in marked inward rotation with the palm looking outwards, resembling the position in Erb's palsy. There is tenderness on pressure, and soon swelling is seen, both being most marked at the epiphyseal line. If the bone affected is superficially situated, as the lower spontovia of the humerus, radius, or tilea, swelling is very apparent, while it may be scarcely perceptible at the upper epithreis of the honorus. The swelling is neually estindeical and moderate in degree, being limited to the extremity of the hone. Separation of the epiphysis may take place, so that erepitation is obtained by moving the limb. With this there is sometimes apparation due to secondary infection. The X-ray shows in many instances an increase in the width of the epiphyseal line which may be very irregular. (Fig. 185.)

In the milder cases, or these which have been subjected to active treatment, both the swelling and the tenderness subside rapidly without supportation; and even though the epiphysis has separated from the shaft it specifily unites. When pseudoparalysis has been the chief symptom, very rapid improvement occurs under treatment, and usually there is complete recovery of function in two or three weeks. If secondary infection takes place the condition is usually fatal.

Syphilitic Ostroperioritis.-This is usually found in infancy only

as the result of a severe infection. It chiefly affects the long iones, especially the tibia, fibula, radius, homeron, phalanges, and metacarpol and metatarnal bones. The bosons are multiple, often symmetrical, and at this age are principally periodical. They are generally numbed note the ends of the shaft. The swellings caused by the periodicis can be made out readily when they are but slightly covered by muscles or fitte may, however, be impossible to demonstrate their presence except by means of the X-ray. The swellings are firm and often distinctly tender. They are frequently associated with the symptoms of syphilitic opinhys-



Fig. 185.—Hanconcav Stromas. Showing irregularity and enageration of line A. Infant two months old.



Fig. 186.—Sprinteric Possosures or ma. Freta. Intest three mouths sid. Same patient as Figs. 187-190. Eight side affected; left side normal.

itis. The X-ray picture shows a fusiform swelling chiefly due to perisiteal thickening. (Fig. 186.)

Suphilitic Darightis.—This is found in infants usually between the third and seventh months. It is not a frequent manifestation of explails. When present there are usually other evidences of tone applicits, ruch as periostral swellings, for the dactylitis is an estroperiostritis but usually differs from that affecting other bones in that the involvement of the lone, even at this early age, is considerable and the periostritis rather slight. By means of the X-ray it can be seen that the phrains involved is much thickened and of denser structure than the normal. Except for the fact that more than one and frequently several phalanges are in-

volved, the symptoms closely resemble the taberculius form. The enlargement is spindle-shaped, insolving the entire phalanx. It is usually not painful. It slowly increases in size and but rarely goes on to expparation or necrosis. The discuss may be arrested and sured by constitutional treatment.

Lysoph Nucles.—These are often palpable. Marked enlargement is uncommon. No sid in diagnosis can be obtained from any but the spotrochlear glands. If these are considerably enlarged in infancy without evident adequate explanation, a respection of syphilis should always be aroused. They may be at times almost the only evidences of the disease.

The only visceral symptoms of importance are, enlargement of the



Fig. 187; Fru. 188.

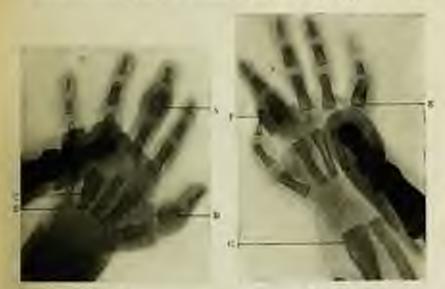
Plan 187, 185 — Newtorm: Harrison. On right hand first photogra of furdinger and force fagor affected; on left hand first photons of though and second photons of second funct.

sphen, which is almost invariably present in the active stage of hereditary syphilis, and jamelice with or without calargement of the liver (see leterus of the Newly Born).

Late Hereditary Syphilia.—The symptoms may come on at any period during childhood or about the time of pulerty, but rarely at a later time than this. They are seen both in these who have had the usual symptoms of hereditary syphilis in early infancy, and in others where the most careful examination into the history fails to during any symptoms whatever of early syphilis. It is fair to assume in such cases either that early symptoms were absent or that they were of trivial importance.

Late hereditary syphilis shows itself by symptoms which in acquired discuse would be classed as tertiary. The most characteristic are the affections of the teeth, the boses, the eyes, gammatous deposits in the solid riscens, the skin or turcous membranes, the breaking down of which may lead to teleration, and, finally, symptoms of disease of the nervous system.

Teeth.-There are no peculiarities in the first teeth of syphilitie chil-



Pes, 180.

Fes. 200.

Fine. 180.—Kase Hawpe as Fau 187, 188. Note that besides the bines shown in the other pictures, two instantical bears (C., (r) are affected in the left hand and the lower end of the radius (C) in the right hand.

dren except their pronuness to early docuy. They are rather more likely to appear early than late.

The characteristic teeth of syphilis are those of the second set. In estimating the diagnostic value of these changes, only the upper central incisors are to be relied upon; these are the test teeth. Although changes

are frequently seen in other teeth, they are not always diagnostic. Typical syphilities teeth, according to Hutchinson, have each a single notels in the center of the edge (Fig. 191). The notch is usually shallow and more or less crescentic in shape. The enamel is generally deficient in the center of the notch,



Pro. 181. - Terroni, "Havenproof's Term," (After Poursier.)

and the tooth here is apt to be discolored. The tooth in other cases are rancesly dwarfed and deformed (Fig. 192). They often laper regularly from the base to the edge, giving rise to the term "screw-driver teeth." The teeth often are not so flat as the normal incisors, but often remaded and pog-like. They are not properly placed, but incline either toward or away from each other. They are addom large enough to touch the adjacent teeth on both sides.

Although Hutchinson's teeth may generally be taken as conclusive evidence of syphilis, they are not invariably so, as Keyes and others have shown. It is to be remembered in this connection that the absence of changes in the teeth is of no importance whatever as evidence that syphilis is not present. Hutchinson states that they are wanting in more than half the cases.

Hover.—The form of disease which is usually seen at this period is an esteoperiostitis, affecting principally the shaft of the long boars and the cranium. Chronic coteoperiostitis is more frequent after the third year, and most of the cases occur between the fifth and fourteenth years. The



Fig. 192 - Strupture Tunin. Bey sight years old; under observation several years with various syphilite numbrishings.

most common sent of disease is the tibia, and next to this the bones of the forearm and the cranium. The following is the frequency with which the different bones were affected in the series of cases exported by Fournier: this in 91 cases, also in 22, radius in 15, cransum in 16, homerus in 18, all others in 37. The process may result either in a diffuse or a localized hyperplasia of bone or in pecrosis.

The typical changes are seen in the tibits. The shaft of the hone is principally or selely affected. There is often produced a very characteristic deformity, consisting of a forward curve of the au-

terror border of the tibus, which has been compared to a saker blade (Figs. 193, 194). In some cases the bone is bent inward at its lower third, resembling somewhat a rachotic curvature. Sometimes the entire shaft of the bone is affected, and it may be greatly enlarged. At other times the enviling is chiefly near the epiphysis, where large bosses may form of sufficient size to interfere with the functions of the joint. Instead of affecting the bone uniformly, the descase often affects only certain parts, leading to the formation of large nodes which are more likely to be followed by necroses than are the other lesions. In most of the cases the process is purely a hyperplastic one, leaving the bone permanently enlarged and the himb often lengthened. Less frequently, there occur gummatous deposits in or beneath the periodeum, which may soften, suppurate, and lead to superficial necrosis, with the fermation of sinuses that remain open until the sequestrum is exfoliated. Syphilitic deposits superimes take place in the interior of the lones, generally

near the articular erids (Fig. 194); these may soften and break down with abscesses, simuses, etc., very much after the manner of a tuberouless inflammation.

The lesions of the other long boxes are essentially the same as of the tibia. They are nearly always symmetrical and often multiple. The course of applicatio esteoperisatitis is very chronic, and some permanent deformity is the rule, naless cases come very early under treatment.

When affecting the bones of the cranium the disease usually takes the form of a gummatous periostitis, which leads to the formation of large



Fig. 101.—Organizate Ostrocremoverms or mm Times. Left title growty enlarged; 101 inches longer than the right, and log 2 meter larger is estrumierous; substitute anterior border. Right tibis sound; being of long standing. Pattern 13 years std.

nodes. These may remain as permanent deformities, or they may break down and supportate, with necrosis of one or both tables of the skull. This may be followed by inflammation of the dura, the pia, and even of the brain itself.

When the long bones are affected, the symptoms are pain, tenderness, and deformity. These come on very gradually, and often the deformity is noticed before eather pain or tenderness is sufficiently marked to attract attention. The pain is regularly werse at night, and often felt only at that time; it may be mild and occasional, or so severe as virtually to persent sleep. There is tenderness on pressure over the bones affected, the acuteness of which will depend upon the activity of the process. When suppuration occurs, it comes very slowly, and never with symptoms of acute inflammation. Sinness usually continue to discharge until a sequestrum is exfoliated. The course of the disease is very tedious, and the whole duration is usually several years.



Pro. 194.—Strutture: Owneconstournes to the Last Trans. Similar losion to that above in Fig. 193, potient 8 years old. The right this is normal.

When the cranium is affected, there are seen irregular nodes, especially upon the frontal and parietal benes. They are from one to two inches in diameter, and project from one-eighth to one-fourth of an inch above the general autline of the skull. There may be pain, tenderness, softening, experimation, and necrosis, as in the long lones.

It is note that disease of the bones of the cranium is due in childrend to any other came than syphilis, and this disease may usually be assumed to exist if transmitten can be excluded. The bones upon the cranium in rickets are always large, smooth, and regular in position, and belong to infancy.

Syphilitic disease of the long boxes is recognized by the nonurnal pain, the tenderness and peculiar deformity, and by the association of other late manifestations of syphilis—i. e., the peculiar nonched teeth, the interstitial keratitis, the enlarged spitrochlear glands, etc. Tuberculous disease generally affects the articular ends of the hones; syphilis nearly always the shaft. The diffuse hyperplasia of the tibus and the saber-like deformity of its anterior border are rarely, if ever, due to any other cause than syphilis. The deformities of the long boxes have in some cases a certain resemblance to those due to rickets, but the two conditions can hardly be confused if a careful examination is made.

Arthrifit.—This may occur in a subarute or even acute form. It is most common in the knee, though any of the large joints may be insulped. The lesion is chiefly synovial. The coset may be sublen with pain and marked tenderness. Effusion into the joint occurs and there is local heat and often a rise in temperature to 101° F, or more. The process usually remains limited to one joint and resists abstitutely all methods of treatment except antisyphilitic treatment, to which it readily yields.

Lymph Nodez.—They are less frequently affected than in adults. In most cases there may be found a moderate degree of enlargement of the postervical and epitrochlear glands, swelling of the latter having considerable diagnostic value. Under normal conditions these can scarcely be felt; but in syphilistic children they may be as large as a pea or a small beam; sometimes two or three of them can be distinguished. Provided no local cause for the swelling exists, they should always create a suspicion of syphilis. The protectical glands are frequently affected, but are not so diagnostic. The degree of enlargement is rarely great. Occasionally there are seen in the neck large masses of avoiden lymph glands which resemble tuberculous swellings. They are, however, very rare.

Special Senser.—The most frequent affection of the eye in late syphilis is interstitial boratitis, the closs connection of which with hereditary syphilis was first pointed out by Hutchinson. It is often found associated with the typical notched teeth. The diagnostic value of keratitis in ayphilis is denied by Fournier, who states that, while often syphilitie, it is not infrequently due simply to malnutrities. We cannot subscribe to this statement. In our experience it is almost always due to syphilis Both eyes are usually affected, and in all degrees of severity, from a slight business of the corner to complete oparity. However, with an early diagnosis and prompt treatment, a marked degree of improvement may be expected in most cases.

Chronic statis may be a result of the acute process seen in early infancy. There is nothing pseudiar about the inflammation in these cases. A form of dealness occurs in other studies, which Hutchinson states is almost invariably due to syphilis. Its onset is quite sudden, without pain. The less of hearing is apt to be permanent, and if it occurs early in childhood it is a cause of deaf-mation.

Skin.—The most important of the later manifestations of syphilis consists in the formation of subcutaneous gunorata. In the early stage they are indunated, static, of a grayish color, with red lorders. Under treatment they disappear quite rapidly by absorption; but when neglected they break down, leaving large deep ulcers. These ulcers are quite characteristic in appearance, but may be conformed with those due to taberculous. The syphilitis ulcer has rounded, thickened, indurated borders, and a base which is depressed and has the appearance of being scooped out. It is semetimes covered by hard crusts and is surrounded by a red areals. It leaves a smooth white cost. The most frequent situation is upon the face and apper part of the legs or thighs. Tuberculum alters have usually soft, flat edges, and do not extend so deeply; they are more irregular in outline; the countrix left is of a purplish color, which becomes red and slowly faths; and tubercle bacilli may be found.

Nose mor Palate.—Disease of these parts generally begins as the breaking down of guarantous deposits in the museus membrane. The nose may as consequence be the seat of a protracted fetial discharge (orems). The disease may take on a destructive form of alternation which is at times pluggedonic, and may cause rapid destruction of the usual cartilages and bones, preferation of the septum, and occasionally of the floor of the metal foscar. There may be necessis of the inchinated bones, the vomer, or the extraction. In the most severe forms the nose may be almost destroyed in the course of a few weeks. There may be at the same time deep alternation of the soft palate, leading to perforation. In a young person this is almost invariably due to syphilis. In many particulars these alternations of the nose and palate resemble luque; they are distinguished by the rapidity of their progress, syphilis often doing a much damage in weeks as is done by logue in years.

Other Symptonic.—Syphilitic disease of the larger and brenchi is rare in childhood. The former may give rise to beareness or aphonia and occasionally to stensois; the latter to a chronic cough and asthmatic attacks. There are no characteristic symptoms belonging to syphilis of the lungs.

The only tisceral changes which aid much in diagnosis are those of the liver and spleen. The liver is often enlarged, semetimes to a marked degree, and occasionally there is ascites, but very seldem jaundice.

Enlargement of the spleen is a very frequent symptom-in fact, it is

almost constant during active syphilitic disease. It is occasionally so swollen as to form an abdominal tumor of considerable size. In one case under our observation, in a boy three years old, the spleen extended free inches below the free border of the ribs, quite to the crest of the ileum. It was associated with moderate enlargement of the liver, as is usually the case.

In addition to the local symptoms of late bereditary syphilis enumerated, there are others of a general character which are quite as important. The body is usually undersized; the constitution is delicate, and shows lest little resistance to all forms of disease; pulerty is frequently delayed, and the development of the breasts and the genital organs often imperfect; anema is usually present, and the skin has a sallow appearance. Mentally, many of these children are somewhat deficient.

Suphilis of the Narcous System.—This may show itself in a great variety of ways. There may be a combination of symptoms giving rise to a more or less distinct clinical picture, indicating diffuse involvement of one or more parts of the brain or cord, or the losion may apparently be limited to a strikingly small area.

Paralysis of single nerves, particularly the cranial nerves, is not uncommon. There may be only failure of one or both pupils to react to light, or there may be strabismus. Sudden deafness may occur. There

may be a gradually developing optic atrophy.

Mention has been made of syphilis as a cause of hydrocephalus. In our experience the association between the two diseases is unusual, but many elinicians with large experience emphasize the fact that hydrocephalus may often be due to syphilis. Epilepsy, also, may depend, but in our experience very infrequently, upon syphilis. Statistics vary much as to the rôle of syphilis in producing feebenindedness. Studies upon inmates in institutions for the feebleminded in this country have shown that not more than two or three per cent have clear clinical evidences of syphilis, while not more than ten per cent without physical symptoms of the discuse give a positive Wassermann reaction. This, of course, does not indicate that syphilis is in the ten per cent the cause of the feeblemindedness. The association of the two conditions may be merely accidental. It is probable that the part of applicia in the production of mental deficiency has been exagginated. Lesions of the osed due to syphilis are distinctly uncomment.

Juvenile paresis is occasionally seen, but it is rare before the fifth year. There is no doubt of its dependence upon bereditary syphilis. The symptoms usually appear abortly before or about the time of puberty. They are quite characteristic. A child that has developed in a practically narmal way gradually begins to lose his shifting to do certain things.

There is loss of memory and a difficulty in speech, which consuls in dropping a syllable or a whole word. If he has been able to write, the capacity to do this is gradually last. Eventually speech is impossible and the intelligence is reduced to a minimum. Walking becomes difficult and later almost impossible. The child loses all sense of clearliness and remains in a domented condition often bet years until death occurs from inantition, bad-sores or from intercurrent disease. There is usually has of reaction of the pupels to light, irregularity of the pupils, and often some degree of optic atrophy. The exchroppinal shad contains an excess of cells and globalin and gives a strongly positive Winsermann reaction. The course is aboutly but progressively downwards.

It is at times difficult to differentiate from juvenile parents a form of cercbral syphilis, which in our experience is more common than the paretic form. The history often gives valuable aid, showing that the child has never appeared entirely normal. There has usually been, almost from the beginning, some, often a marked, degree of mental impairment and speech has been slowly and imperfectly acquired. The children are oftentimes restless and disobedient. They may have screaming attacks. The reflexes may be exaggerated or absent. Attacks of headache and vertigo with vemiting are not uncommon. There may be unequal pupils or failure to react to light. Some degree of optic atrophy is generally present. Hemiplegic attacks may occur in the course of the disease or they may appear as the first evidence of cerebral involvement. These attacks may occur first on one side and then on the other, and the paralysis often improves to a marked degree, even without treatment. With this form of cerebral exphilis there is not the same tendency to mental and physical deterioration as with puresis. The children may live many mars in about the same mental condition. Sometimes with treatment, especially if it is begin early, considerable improvement tecurs. The cercbrospinal fluid shows in these cases also an excess of cells and globelin and always gives a strongly positive Wassermann reaction. As is the case with puresis, it is exceedingly difficult to diminish the intensity of or to abolish the Wassermann reaction in the spinal fluid by antisypholitic freatment of any kind, no matter how vigorously given or how often repeated.

Table may be found in childhood as the result of hereditary syphilis but is very encommon. The symptoms are similar to those of the adult form of the disease, but some of them may be about. The Argyl-Robertson pupil is constant, but the putellar reflexes may not be lost and Hemberg's symptom may not be marked. Incontinence of urine is frequent. The course of the discose is exceedingly slow. It may lost for diffects or twenty years or even more.

Diagnosis. The diagnosis of early stphills in most cases is not diff-

cult. The coryen, eruption, labial floores, mucous patches about the area and genitals, calarged spleen, and later the general cachecia—all units to form a picture which it is difficult to mistake. In irregular cases the diagnosis is easy just in proportion to the number of the for-going symptoms which are present. Special care should be taken not to confound the moist papules of simple intertrigo upon the buttocks or thighs with those of syphilis. Much assistance may be obtained, especially in early cases, from the discovery of the spirochetae in the external lesions. This is a means of diagnosis which is too seldom employed. In a series of 34 cases, mostly early ones, in the hospital service of one of us, there were external lesions in 25, in all but one of which the spirochetae were demonstrated. The dark field is useful but not essential. They can easily be demonstrated by the India ink method. The Wassermann reaction has the same value as in polults.

In late appliilis the following synaptoms are the most reliable for diagnosis; notching of the teeth, falling in of the bridge of the nose, interstitial locatitis, deafness not traceable to ordinary citits, enlargement of the spleen and epitrochlear glands, ulceration of the palate or nose, the subsr-like deformity of the tibia, and nodes upon the tibia or cranium. There are often found in older children indefinite symptoms in regard to which a empirion of syphilis exists. For such cases the Wassermann test is of very great value.

It becomes at times important to distinguish hereditary from asquired syphilis. Visceral lesions in acquired syphilis are not common and belong to the late period of the disease; in the hereditary form they are well-nigh constant and occur early, often being present at birth. The acute epiphysidis, sometimes accompanied by pseudoparalysis, selsion if ever occurs in acquired syphilis, though frequent in the hereditary form. Symptoms due to defects in development, like the misshapen finger-mils, are seen only in hereditary syphilis. The early symptoms referable to the mucous membranes and miscocutaneous surfaces—coryra, hourseness, hemorrhages, labial fiscures, etc.—so characteristic of hereditary syphilis, have no place in the acquired form, while the single primary lesion sometimes found in the acquired form does not exist in the hereditary disease.

The value of Nogurhi's cutaneous "factin" test has not yet been finally settled. Considerable experience is needed to interpret results.

Prognosis.—Generally speaking, the prognosis is worse in infantile syphilis than in that of adults. In infancy it is much worse when hereditary than when acquired, for the reason that often the child who is the subject of hereditary syphilis has been affected by the poison from the very beginning of his existence, and this has modified his entire detelopment. The results of 296 syphilitic programoies observed by Julien (Paris) were as follows: abortion occurred in 36, stillborths in 8, and 69 children died soon after birth, making a total mortality of 53 per cent; 50 were living and syphilitic; only 65 living and in good health. Still worse were the results in cases observed by Le Pileur: of 154 pregnancies in syphilitic women, there were 120 abortions or stillbirths, 26 children died soon after birth, and only 8 survived. The statistics of the Foundling Asylum in Mescow for ten years showed that of 2,038 syphilitic infants the mortality was over 76 per cent.

Such a mortality as that indicated in the above statistics is seen only in institutions where little or no previous treatment has been employed,

In private practice certainly nothing approaching it occurs,

In addition to those who die early as the result of syphilitic infection, there must be added many whose constitutions are so impaired by syphilis that they full an easy prey in infancy to pneuments, diarrhea, or other forms of soute disease. The remote effects of syphilis in infancy it is hard to estimate; it may exert an injurious influence upon the constitution in childhood and even throughout the life of the individual.

The prognosis in an individual case depends upon the age at which the symptoms develop, the time when treatment is begun, upon its thoroughness, and upon the surroundings and mode of nourishment of the child. The outlock is better the longer after hirth the first symptoms appear; it is also very much better in infants who are nursed than in those who are artificially fed.

As compared with syphilis of the shalt, relapses are less frequent, and when they occur early they are nearly always the result of insufficient treatment. If proper treatment is carried out, those severe late symptoms are not common; patients are usually free from all symptoms until six or seven years old, or until near the time of pulcety—two periods when they are likely to develop. We must conclude that treatment persisted in only for a short time and not energetic enough to influence in any way the Wassermann reaction has, nevertheless, a great influence in preventing the further ravages of the disease. We have observed children after an interval of several years that had been treated in this unsatisfactory way and could find no evidence of the disease but a positive Wassermann reaction. It is a fact also that most of the patients that apply for treatment for late hereditary applicits have never secrived any treatment.

The prognosis is better in the later children of syphilitic parents than in the carbor ones, provided infection has proceeded the birth of all the children. This fact illustrates the general tendency of the syphilitic poison to diminish in virulence as time passes, even without treatment. The following instance cited by Bertin well illustrates this point;

In the first pregnancy, the mother aborted with a dead child at the

sixth month; in the accord, at the seventh menth; in the third, at seven and a half months; in the fourth the child was born at term, and lived eighteen days; in the fifth it lived six weeks; in the sixth the child lived lear months, without treatment.

The prognous of syphilis of the nervous system should be considered by itself. Certain of the manifestations, such as localized paralyses, may yield promptly to treatment. It is also reported that many cases of syphilitic epilepsy and hydrocephalus have been greatly improved or cured. Gummatous lesions usually disappear promptly with appropriate treatment as in acquired syphilis. But the lesions of the nervous system are usually the result of arterial disease or of meningitis and excephalitis. These are very little influenced by treatment. In cases of diffuse involvement of the brain and in juvenile parests, we have not seen facting benefit from even the most energetic and long-continued treatment with salvarian or with mercury and iodids.

Prophylaxis.—No infected person should be allowed to marry until at least two years have passed after the initial serv, treatment being continued meanwhile; nor if there are any active symptoms, no matter how long a time has clapsed since infection, nor if the Wassermann reaction is positive.

The mother should be treated during her programry: (1) If she is syphilitic, whether the disease was acquired at the time of conception or subsequently; (0) if the father is known to be suffering from syphilis, whether the mother has symptoms or not; (3) if the mother has ever precisinely shown signs of apphilis, even if she has had no artire symptoms for a considerable period. In all these conditions if efficient treatment is carried on throughout pregnancy there is a strong probability, but in no case a certainty, that the child will escape. The third condition mentioned is the one in which treatment is most likely to be neglected, especially if the mother has previously borne a child who was not syphilitic. Syphilis, however, shows a strong tendency to reappear and become active during pregnancy, even though it has been long quiescent, as the following case rited by Difay shows:

A woman who had lost seven children from syphilis was put under treatment during the eighth pregnancy; result—shild born healthy, and continued so. In the ninth pregnancy treatment was continued with a like result; in the tenth pregnancy, no treatment, child syphilitic, dying when six months old; in the eleventh pregnancy, treatment repeated, child healthy.

The danger of infection during labor is slight. As the greatest danger of infecting a child after birth is from his parents or a wet-nurse, syphilitic parents should be duly warned of the danger to their children, and especially should be cautioned against kissing them or sleeping in the same bed with them. The utmost care should be exercised to prevent a healthy child from being infected by a syphilatic nurse. A nurse should never be accepted without a thorough physical examination, no matter how clear a history may be given. As a syphilatic child in the heavehold may be the means of infecting other children, the same precautions should be taken as in the case of other contagious diseases. The shielf danger to other children comes from kissing or from using bottles, spoons, or cups which have been infected; as the syphilitic infant is chiefly dangerous on account of the lesions in the month. Trouble most frequently occurs because of ignorance regarding the nature of the discuse. It is possible for a syphilitic child to nurse a healthy woman without communicating syphile, if the child's mouth contains no begins and the nipple not allowed to become dissured; but it is an experiment which should never be tried.

Treatment. This should always be begun as soon as the first positive symptoms of syphilis appear. In certain circumstances it may be advisable not to wait for symptoms; as, for example, when both parents have recently suffered from active symptoms, when previous children have died soon after birth, or when, with marked symptoms in the perents, the child exhibits the cachevia of syphilis, but no definite local symptoms. Such anticipatory treatment need not be continued after a negative Wassermann reaction is obtained. It should be remembered, however, that even a syphilitic infant may give a negative Wassermann reaction for the first two or three weeks of life.

The indirect treatment, designed to reach the shild through the mother's milk, has fallen into deserved disuse, as it is very uncertain and altogether unsatisfactory.

The two drugs most useful in treatment are mercury and salvarian. Mercury is as much a specific for hereditary as for acquired sphills. There are many ways of introducing it into the system-by inunctions, by mouth, by funigations, baths, or hypodermically. In most cases, inunction is the number to be preferred with children. Mercurial continent in doses of from ten to twenty grains, depending upon the size of the child, diluted with an equal amount of vaseline may be rubbed into the abdomen, axillae, or the inner surface of the thighs. It is advisable to change the place of insurction from time to time and if this is done it is extremely rare that crythema is produced. If may advantageously be placed, with small infants, upon the inner surface of an abdominal binder. If for any reason inunctions are objectionable, as they may be when the family are to be kept in ignorance, either the gray powder or the hicklorid may be given by mouth. The usual floor of the gray powder is gr. 55. three times a day, and that of the bodderid, gr. 1-60 three times a day, always well diluted. It is rare that larger doses are advisable. Calomel

in doses of 1-10 gr. four times a day is oftentimes a rapid method of bringing the system under the influence of mercury. Other methods of administration and other preparations offer no advantages and have some very obvious disadvantages. The duration of mercurial treatment should be at least one year. The doses during the last six months may be reduced to one half or one third of those employed while active symptoms were present. It is well to repeat two or three months of mercurial treatment during the second and third years, even if no symptoms are present. Treatment should always be employed longer than a year if symptoms exist. It is often better not to give the mercury continuously, but with short periods of intermission.

Salvarsan is quite as efficacions in infants as in older patients. Single doses of salvarean do not cure syphilis and several doses may not do so. A repetition is always necessary and the best results are obtained when advarian is combined with the mercurial treatment. In such circumstances, it is wise to omit the mercury for a few days before and after the injection of salvarsan. The intravenous method of administration of salvarsan is altogether to be preferred on account of its irritating effects when injected into the tissues. The noral dose is 45 gram for very young infants and 0.1 gram for those who are five or six months. eld. More exactly it may be calculated as 0.01 gram for each kilogram (.005 per pound) of body weight. With infants, the injection may be made into a vein of the scalp or the external jugular vein. No dissection is necessary but care should be taken that now of the injected fluid is allowed to escape into the surrounding tissue, otherwise sloughing may result. Neonlyaman has the advantages of being more readily prepared, much less irritating in its effect and consequently much less likely to cause necrous if any escapes into the tissues. It is, however, less active and the dose should be one and one-half times that of salrarsan. The usual dozes of neosalvarian required by infants are readily given in 5 e.c. of freshly distilled water. The intravences use of this perpuration is greatly to be preferred. If, however, for any reason this is not practicable, neosalvarian may be given intramuscularly, disselved in some bland oil such as benesimel. Salvarsan should not be sogiven.

Injections of salvarant should not be made more frequently than once in two weeks, usually repeated four or five times and controlled by the Wassermann reaction. It is uncommon for a negative reaction to be obtained after less than three injections; we have used as many as night and have found at times the reaction persistently positive.

The iodid of potassium may be used in combination with recentry whenever such bosious exist as are classed among adults as tertiary. This includes all the late manifestations and the earlier ones whenever the bones or viscers are affected. The iodid is usually well borne by children and may be given in almost any desired decays. In infancy, not more than gr. xx daily are required, but in older children one or two

drams daily may be given, always largely diluted.

Syphilis of the nervous system is often but slightly affected by treatment, as has been mentioned previously. The symptoms of sharply tocalized disease, including the gummatous lesions, are usually promptly affected, but diffuse carehrospinal syphilis, including puresis and takes is hardly benefited at all. The Wassermann reaction in the blood may sometimes be made negative, but the Wassermann reaction of the cerebrospinal fluid remains positive and the symptoms are in almost all instances entirely maffected.

The general treatment of syphilis is important and should not be neglected. After specific treatment has been carried on for a time, particularly if rapidly pushed, the shild often becomes anomic and suffers greatly from malnutrition. In such circumstances, it is usually wise to discontinuous necessity altogether for a time, or at least to reduce the dose very much. Such a change is frequently found to act

most beneficially.

Local Treatment,—Ulcerative lesions of the skin require deanliness, dusting with caloniel or localowin, or bathing with the black wash. Murous patches should be dusted with equal parts of caloniel and bismuth. Fissures and ulcers of the microis membranes should be treated by nitrate of silver. Plagestenic ulcers of the palate or nose should be cauterized with nitric acid or the acid nitrate of mercury. The late syphilitic ulcers of the skin, due to the breaking down of guinnata, should be treated aseptically.

CHAPTER XII

INPLUENZA

In the spidemic of 1892 Pfeiffer isolated and described an organism which he believed to be the cause of influenza; it is generally known as the E. influenza or Pfeiffer's bacillus. The correctness of Pfeiffer's views has been questioned by many good observers and will be discussed in the next article. But this organism is certainly one of considerable importance in respiratory diseases and is associated with a pretty definite group of clinical symptoms. In the present chapter will be considered only the disease or diseases associated with Pfeiffer's bacillus, and when occurring sporadically or in small seasonal authoraks.

Etiology .- Pfeiffer's bacillus, or the influenza bacillus as it is known

in liberature, is chiefly found in the secretions of the lower respiratory tract; less often in those of the upper tract-the rhinopharens and discharges from the ears. As it usually occurs, it has been shown by Wellstein to be an organism of low virulence. It produces few immune bodies and consequently complement fivation can seldem be demonstrated in the serum of these patients. It does not agglutinate except in very low dilutions. No immunity is developed from such attacks and hence patients are continually liable to recurrent influenza infection. Like the manmococcus, Pfeiffer's bacilles may be present in the respiratory secretions without producing any symptoms whatever. It may be of no significance. At times very virulent strains of the influenza bacillus are met with. These produce antibodies and cause immunity; but unfortunately because of their virulence the patient is likely to be averpowered before this has occurred. The organism may quickly find its way from the respiratory tract into the blood stream, producing an intense septicemia and leading to the development of a severe form of pucumonia, to cerebrospinal meningitis, and rarely to inflammation of the large joints. Pfeiffer's bacillus belongs to the hemoglobinophilic group, growing only on a medium containing hemoglobin. It can be demonstrated in the sputnm with certainty only by cultivation, smears being entirely unsatisfactory. In scule cases it may disappear very surly; but in pretracted cases its brownce run often be demonstrated for weeks or even months. In the respiratory inflammations in which the organism occurs, although it may he found in pure culture, it is usually associated with the pneumococcus or the staphylococcus numeus, less frequently with the streptococcus. In routine cultures made from the sputtim in acute respiratory infections in the winter and spring in the Bakies' Hospital during a period of six years the influenza bacillus was found in different years in from 28 to 48 per cant of the cases.

Sporadic influence may be ranked as moderately contagious. It is eather more communicable than presumeneess infections, but very much less so than epidemic influence. The influence bacillus is regularly found in New York in the cold season, beginning early in November, but most years is not frequently found till after January. It is easily disappears completely about the end of May with the advent of very warm weather. Its prevalence in the winter and spring of some seasons is so great that it may often be said to be epidemic. All ages are liable to the disease, infants especially so.

Lestons. The influenza bacillies is much less frequently associated with the inflammations of the upper than the lower respiratory tract. It is found in comparatively few of the cases of acute thinopharyngitis, in the averes inflammations which invade the antrum, the frontal or ethinodal sinus or the middle car. It is much more frequently associated with influenceations of the traches, brenchi, and lungs. There are no characteristic lesions of influence. These found in the respiratory tract differ little from the same inflammations when due to other organisms. The pneumonia is nearly always of the bronchopneumonia type. In certain cases resolution is much delayed or is incomplete and the inflammation may then develop into a chronic intenstitial type which may continue indefinitely, with the later development of fibrosis in the lung of considerable extent with bronchiectasis, etc.



Pag. 195.—Temperature Court of Useometrapp Isrueuses. Infant fourteen months old. No licul signs of dimain; repeated blood examinations for mulicia negative; the wide finemations of the temperature independent of therapoutic measures. Prompt constrain of fever on removal from the sity.

Symptoms.—The symptoms of influence are in part due to the general infection and in part to the local influences which are excited. These may be regarded either in the light of manifestations or possibly as complications. The clinical manifestations of influence are numerous and often exceedingly possing in diagnosis. These most frequently next with are the following:

 There may be only symptoms of a general infection of moderate severity, often with a high temperature but with few or no respiratory symptoms.

There are cases with symptoms of mold respiratory infections—broachitis, oticis, etc.—or others with severe broachitis or broachiqueus.

ments which present little unusual in their symptoms except quite entraordinary fluctuations of temperature.

- A protracted form of bronchopucumenta or recurring attacks of acute bronchogucumenta with incomplete resolution, often mistaken for tuberculosis.
- A protracted mild respiratory entarm with little fever but with a paroxyemal cough which is almost indistinguishable from whospingcough.

5. An especially severe form of infection with general blood infec-

tion often terminating in meningitie.

The chart (Fig. 195) well illustrates the first group of cases. There are often no local symptoms of importance to be found on the most careful examination; there is a high and widely-fluctuating temperature which is quite out of proportion to the other semptoms. The child does not appear to be seniously ill, yet the beight of the temperature and its wide finetuations are most alarming. Sometimes at the height of the fever there may be marked nervous symptoms - irritability, byperesthesia, rigidity, stuper, etc., strongly saggestive of cerebrospinal meningitis; but with the fall in the temperature all these symptoms pass off in a few hours. In most of the eases the only symptoms present are such as

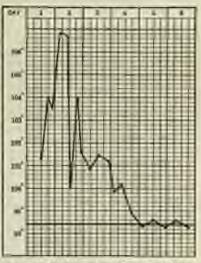


Fig. 196.—Acces Bacochorpersonna. Amounts Tree, Communication by Parenta in an Issuer fex Moorins Out. The entire left long posteriorly was involved.

accompany high temperature from any cause. In some there is an acute erythematous blush of the fances and in many there is a slight cough. Often such a temperature as that shown in the chart may continue for several days, subside without treatment, and all symptoms recur after an interval of a few days or one or two weeks; finally a small area of pneumonia may be discovered, or yestings offits may develop as a later complication. The improvement in symptoms by change in climate is sometimes most surprising and occasionally an equally shrupt ending of the attack may occur without it. More frequently, however, the symptoms subside gradually. Malarin or some hidden focus of suppuration are most frequently diagnosticated.

The cases of pneumonia associated with influence are sometimes of such brief duration as to be classed as abortive (Fig. 126). The attack

tegins like an ordinary pneumonia of perhaps more than usual severity; but after two or three days, generally before signs of complete consolidation have appeared, a rapid subsidence of symptoms and signs takes place with a speedy convalencence. In other cases of pneumonia more often seen the physical signs and general symptoms do not differ essentially from those of an ordinary postmonia, but the temperature shows the same tendency to high and irregular fluctuations without evident reason, similar to those seen in the first group considered (see Fig. 62, Chapter on Pneumonia).

Influenza complicated by stitis often presents a most difficult problem in diagnosis. The early part of the attack may be with general symp-

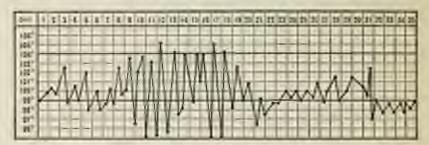


Fig. 107.—Increasing an expected of the control of the parameters of the control of the control

tons which are not particularly characteristic. Office develops after a time as a complication; the ears are opened, the temperature does not suborde, however, but assumes the widely fluctuating character seen in many cases of influence. It is often assumed that the continuance of the temperature is the to some grave condition associated with the office—mastoiditis, sinus throudeness, etc.—and serious operations have offen been performed in these circumstances; whereas the fever was simply a numification of the general influence infection upon which the purscentees has of course had no effect (Fig. 197). Intercurrent attacks of influence occurring in surgical cases with few or no respiratory symptoms may also be very pureling.

The most characteristic forms of pneumonia accompanying influents are the cases which in the early part of the attack may show little that is unusual except the very irregular temperature curve. The signs are like those of ordinary bronchopneumonia, often with a lobar type of consolidation. The source is a very protracted one. The signs clear up very slowly and importedly. The children get better, but they do not get well. One attack often successle another, separated constitues by an interval of only a few days, and coractines of several weeks, and so a patient may go on for the greater part of a suson. Tuberculosis is usually suspected, and no doubt it is frequently the explanation of similar symptoms. But we see many cases which are not tuberculous; the won Pirquet test is negative and tubercle basilli are not found in the spatime, but the influenza basillus is often regularly found for months. The peristence of the organism in the lungs and smaller broads is exceeded only by that of the tubercle basillus. Many of these cases recover slowly and recover completely so far as can be determined clinically. There are some, however, which go on to chronic interstitial pneumonia and a few which develop branchiectusis.

Influence may be accompanied by a peroxyomal cough which is hard to distinguish from pertussis. There is a mild degree of laryage-tracheities or tracheobronchitis with few constitutional symptoms. Such a cough we have seen continue for from four to six works with puroxyoms so severe as to excite veniting. We have observed it in families of children who had pertionally had pertussis. Burdet's bacillus could not be discovered in the sputim but the influenza bacillus was present. There was no lymphocytosis but only a moderate polymorphomocker leucocytosis. We believe that many of the reported instances of second attacks of pertussis are of this nature.

The very virulent forms of influenza are not common. It is usually only on account of the polymenary complications that the attacks are serious. Every now and then, however, one encounters the especially severe type. The early symptoms often are not grave and for two or three days the potient's combition may excite no apprehension, when there develops, often quite rapidly, a state of profound general septicemia with great prostration and a severe passumonia; or there are seen convulsions, drowsiness and stopes, hyperesthesia and rigidity; in short the symptoms of an acute meaningitis which in our experience has been invariably fatal. The blood cultures in these cases regularly show the presence of the influenza harillus.

Supporation in the large joints we have in a few instances sent in inductor, in which this organism was found in the pas in pure culture. Usually this occurs as a late symptom. We have in one case seen it as the first definite local symptom. A boy of eight months after five days of general febrile symptoms developed swelling of an ellow and ankle. When first seen one week later there was general prestration, and the infinence bacillus was grown from pas asparated from both joints. The following day convulsions occurred and the cyrebesspinal fluid was turbid and contained the same organism. It was also found in the blood culture. Death from meningitis occurred three days later and at antopy the influence bacillus was obtained from brain, lungs, and blood. This proved to be one of the most virulent strains of the influence bacillus ever tested in the hospital laboratory.

The influenza bacillas is associated chiefly with inflammations of the lower respiratory tract; in which respect it closely resembles the preumococcus. The two organisms are often associated in inflammations of the lungs and brenchi. It has also the same tendency as the presumecoccus when in virulent form to excite a general septicemia, cerebrospinal meningitis and occasionally joint suppuration. It differs from it in being much less frequently associated with inflammations of the upper respiratory tract, and in occurring almost solely in the cold season, while preumococcus infections prevail throughout the statire year.

Gastro-intestinal symptoms associated with the influence bacillus we have not seen other than those that may occur with any form of acute februle illness.

Complications and Sequelae.—The most frequent complications are bronchitis, pusumonia, otitis, and adenitis. In most of the cases with high temperature the urine contains albumin, and acute nephritis is occasionally seen. We have seen three cases of homorrhagic replicits in a single season. All recovered promptly. In one case the influenza basillus was obtained from the urine by culture. One of the most frequent sequelae is anomia; this may be severe. Following the inflammation of the nuccous membranes, there may be chronic colargement of the certical lymph glands. Attacks of influenza bear the same relation to the development of tuberculosis as do those of measles.

Convalescence after influence is often very slow, and it may be months before the full offects of a severe attack have disappeared. For a long time the muccus membranes are in an extremely sensitive condition. Belapses are often brought about by slight exposure before the symptoms have quite disappeared.

Diagnosis.—The ardinary head colds even when severe and epidemic are very rarely due to influence infection. The features which distinguish influence infections of the respiratory tract from those due to other cames are, the peculiar range of temperature, the tendency to chaomicity, to relapses, and to recurrences. A very high and widely-fluctuating temperature accompanied by few constitutional symptoms in the winter season is always suggestive. Influence can be diagnosticated with certainty only by cultures which should be made upon blood agar. These should be made from the bronchial secretion which is obtained as in tuberculosis (q.v.). Repeated examinations are frequently necessary. Pharyugeal cultures are not reliable. In some typical cases we have been mable to find it at all during life though it was found in the lungs at autoper.

Prognosis.—Uncomplicated cases are solden fatal, even in infants. Though the temperature is very high, recovery may be predicted as long as there is no evidence of important complications. In a word, influence is serious when there are pulmonary complications, but rarely otherwise, except in its virulent form, which, however, is infrequent. In this, general blood infection and meningitis are likely to occur.

Treatment.—The communicability of the discuse makes it desirable that cases of influence should be isolated whenever practicable. As there is no specific for influenza, the treatment is conducted along the same general lines as in other respiratory infections. The temperature rarely calls for antipyretic measures; for, although very high at times, there is very rarely a sustained high temperature. In our experience young children with influenza are not benefited by very cold air, but often made worse by it. Fresh nir however is indispensable but at modernie temperature, i.e., 62° to 65° F. Pains should be taken to assid exposure during convalencence, and especially should children with tuberculous tendencies be closely watched. The persistent cough which is so frequent a sequel to influenza is best treated by cod liver oil and preceste; but children who have prolonged or recurring attacks either with or without pulmonary complications should if possible be sent to a warm dry climate. If this is impossible, delicate children are best look indoors during the cold season but frequently changed from one apartment to amother.

EPIDEMIC INFLUENZA

The disease prevails epidemically and pandemically, its greatest scurrence in history being the great pundemic of 1918, in which the braths in the United States alone were estimated at 400,000. In some large communities fully one-third of the population were attacked. The disease is highly contagious, in this respect resembling measles. It is readily communicated directly from person to person; no other mode of conveyance has get been proven. Its infectivity is apparently greatest in the very early stage, possibly even before the beginning of active symptoms.

Barteriological observations made in this disease have thus far been inconclusive. Many investigators still regard Pfeiffer's bacillus as the cause, finding it present in the secretions of the respondery tract in all severe cases, and explaining its severity and high communicability as due to greatly increased virulence. They find it is largest numbers and in purset culture at the very beginning of the attack; but it is soon mixed with other organisms. The strongest evidence in favor of Pfesifer's bacillus is the complement fixation reaction which can usually be demonstrated at the end of the first week, generally persists for about two menths, but it appears to be lost soon after this. By other observers the essential etiological factor is considered as still undiscovered; the B. influence, as well as the pseumococcus, the streptococcus and other organisms found, all being regarded as secondary invaders which, while not the cause of the discuss, still play a very important part in determining the clinical type, the complications and largely affecting its mortality.

Symptoms.-Epidemic influence has the characteristics of a general rather than a respiratory disease. The onset is abrupt, with chilliness or even a pronounced chill, with prostration, headache, general pains in the muscles of the back, neck and extremities. There may be comiting and diarrhea. Epistasis is not uncommon. The face is often deeply. suffused and in some cases there are catarrhal symptoms like those seen in the invasion of measles. In others these may be entirely wanting. The appearance of the throat is often characteristic; there is an intense blash involving the entire pharyns, tonsils, usula and soft palate. Evadate on the torsils is not common. The amount of general perstration is considerable, even in cases of only moderate severity. Fever is always present but its amount varies greatly. Some of the most severe cases may not have a temperature over 100° or 101° P., while in others which turn out to be less severs, the temperature may quickly rise to 1050 or 1060 F. In general, however, the temperature is to proportion to the severity of the attack. The usual duration of the fever in incomplicated cases is but three or four days, falling gradually to normal. With the fall in temperature all the symptoms rapidly subside except the general prostration which often continues for a rather surprising period.

As a rule, the lencocyte count is not increased and the percentage of polymorphonucleurs is usually less than that of the lymphocytes. A leucopenia is a distinctive feature of severe forms of the disease, though in our experience it is less marked in children than in adults.

Respiratory symptoms are sometimes almost wanting; but in most cases there is cough and signs of brenchitis of the large tubes, or the rough is of the large-processed type, the large-gual involvement sometimes being so severe as to cause obstructive dyspissa. In the most severe cases paramonia is usually present, develops early and is the cause of death. The type is generally bronchopneumonia; large areas of consolidation are infrequent. The course of the paramonia is very arregular; it may be of the acute congestive type, electing up rapidly after

three or four days; or it is very prolonged and it may be followed by a chronic form of the disease. Plearisy and empyons are not more common than in brouchopseumonia occurring under other conditions. Pericarditis, endocarditis and messagitis are all rare.

The gustro-intestinal symptoms have nothing characteristic about them. Vomiting is selfom seen except at the enect; but diarrhea may be a prominent feature of the attack.

Treatment.-A great variety of vaccines have been employed, both for prevention and treatment of this disease, but it cannot be said that the value of any vaccine has vei been demonstrated. Treatment therefore resolves itself into that of the patient's symptoms and the complications as they arise. Confinement to bed should be insisted upon for all, even the mildest, cases; after attacks of moderate severity this should be continued for several days after the temperature is normal. The lowels should be freely opened, and the general pains relieved by small doses of aspirin or phenaretin and colein. Food should not be urged. but water given freely. Isolation of the patient should be practiced whenever possible, but unfortunately it can rarely be early enough to prevent the spread of the disease in a homehold. Children with epidemic influents do much better when cases are separated; and home treatment eather than hospital treatment should be urged when practicable. The everity of attacks and the frequency of complications are increased by erowding many patients together just as in the case of measles. Masks worn by nurses or attendants apparently have some value in diminishing the risks of exposure; but since the greatest danger of infection is probably at the very beginning of the attack, the practical mefulness of the mask is not great.

The closure of schools and other places of assembly during an epidemic may be of value in country districts; but in cities such measures are of doubtful efficacy in checking the spread of the disease.

CHAPTER XIII

MALARIA

Malasta is an infectious disease due to the presence in the blood of a specific organism often called the plassocious, but more exactly the hematocytosove malarise. It manifests itself in children by neute febrile attacks which are even in adults and by chronic mularial posseoing.

Etiology.—The mularial organism was discovered by Laveran in 1881; it enters the blood through the bits of a mosquite belonging to the genus december, and probably in no other way. For a general discussion of the malarial parasite, its methods of staining, etc., the reader is referred to works on clinical modeline.

Malaria affects all ages, even the merly-born infant. We must accept with some allowance the statements made by the older writers upon the subject of intra-uterine infection, but in the following case reported by Crandall, there seems little should that the disease was contracted in alrea: For ten slays before delivery the mether had suffered from a tertian intermettent of moderate severity. Eighteen hours after birth the shild was noticed to have cold hands and feet, blue lips and mils, and a pinched face. These symptoms haded about half an hour and were followed by a distinct fever. Upon the following day the paroxysm was repeated. Examination of the blood of the mother and the shild revealed the malarial organisms in both cases.

Malaria is more frequently overlooked in young children than in later life, from the fact that its forms are more irregular, and this has led to the belief that young children are less liable than adults to the disease. We believe, however, the opposite to be the case. In a large number of instances where families have been exposed to malarial poisoning we have noted that the young children were frequently the first to show the symptoms of the disease,

Malaria is an endemic disease prevailing in certain localities. Exact knowledge regarding the mode of infection has cleared up many obscure points in its etiology. The ride of the mosquito explains the greater liability to contract malaria after smeet and during the night, the danger from stagmant points and pools of water, the peculiar susceptibility of infants and young children, and the greater frequency of the disease in the spring and summer. Malarial attacks may, however, occur at any season, since the seganism may be latent in the body for an indefinite time; how long it is impossible to say, but these seems to be conclusive proof that it may be for many months. Attacks of malaria very often occur when the general health has been reduced by some other cause, particularly by disturbances of digestion.

Lesions.—Opportunities for a study of the pseuliarities of the lesions of malaria in children are infrequent, especially in New York, as fatal cases are extremely rare. We have seen but two. As observed by others, the lesions do not differ in any marked way from those of the adult form of the disease. The most important changes are the destruction of the red corpuscles of the blood, enlargement, and in chronic cases hyperplasia with pigmentation of the spleen; less frequently pigmentation of the liver, kidneys, and brain. Prenusonia and gastro-enterities are occasional complications.

Symptoms.—The clinical forms of malarial fever in children from six to ten years old, do not differ essentially from the same disease in adults. Both tertian (Fig. 199) and estimo-autumnal (Fig. 200) attacks securwith considerable frequency, the former being the type most often seen. Double tertian infection (Fig. 198) is not uncommon but along the middle Atlantic coast the quartan type, unless imported, is unknown. The stages of the paroxysm are generally well marked. The cold stage begins with a chill or remitting, with headache, lassetude, and general

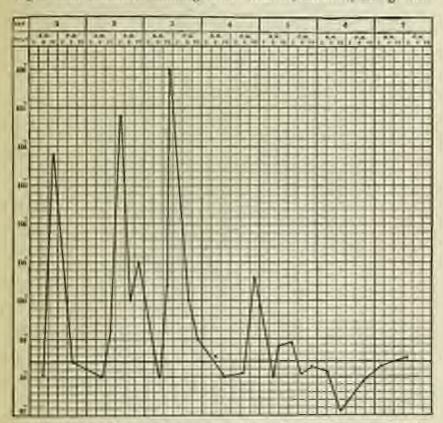


Fig. 198.—Typical, Maraman Temperature, Dorone Typicals Type as a Roy Six. Years One. Each purceyon preveded by a shill. It will be noticed that the temperature save higher with each succeeding purceyon. X marks the time when quiam was begun.

pains. The hot stage is usually characterized by a higher temperature than in adults, and this is followed by the sweating stage, which is generally marked. The pareaysm may be repeated every other day or every day, depending upon whether there is a single or double tertian infection, until controlled by quinin. Less frequently there is an estim-autumnal infection and the fever is remittent from the beginning and the constitutional symptoms are of greater severity. In this form there is

murked prostration, the tongue is thickly coated, there are often tenderness and pain in the region of the liver, and occasionally there is slight jumblice.

In infants and very young children peculiar types of malaris are seen. A well-marked intermattent fever with distinct stages is often about, many cases assuming more of a remittent type or an irregular

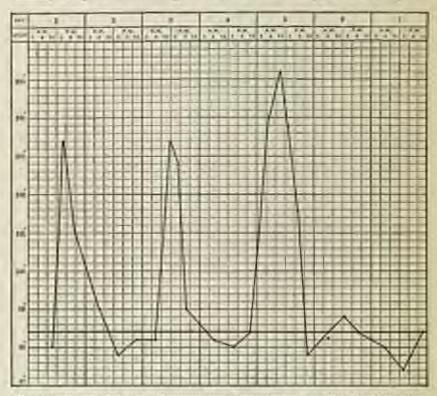


Fig. 199.—Terresal Macausa, Tamenautum. Teneraw Tere, me a Box Free Yacas Oun, Ounce with vocating and drownings, but no chill. This was an articipating better, the first parasyon occurring at 3 s.m., the second at 12 m., the third at 10 a.m., X marks the time when quains was begun.

form of intermittent (Fig. 200). The enset is usually abrapt with vomiting, a well-marked chill being rare. Malarial chills are not often witnessed in children under five years old. They are replaced in infants by cold hands and feet, blue lips and nails, sometimes slight general cyanosis, pallor, drawsiness, and prostration. Vomiting has been present in two-thirds of our sive cases. Several times we have seen a malarial attack ushered in by convulsions.

The fever is relatively higher than in adults, rising rapidly to 104° or 105° F., occasionally to 106° or 106.5° F. This continues from four

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to twelve hours and gradually falls, usually to normal. The other constitutional symptoms of the febrile stage are much less severe than in most diseases with the same elevation of temperature. The aveating stage is only elightly marked and is often absent eltogether. With the fall in the temperature there is a gradual subsidence of all the other symptoms of the febrile stage.

After the first purceyon the patient may be quite well for several

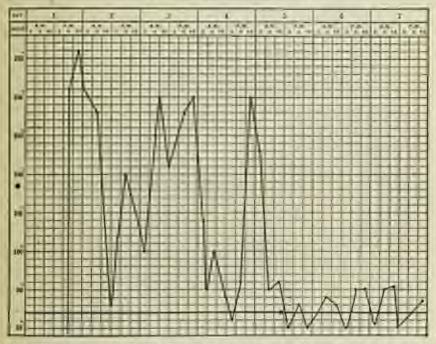


Fig. 200.—An Improvement Malastrat Temperatures (new to Enterior Astronomical Instamonth as a Change News Meaving Olin. The parangons on the fourth day was necessarily an attack of acque princessary competions which come need being fairly is marke the time when quisin was begin. Although the course of the temperature is insignally, it touched the portion has both on the second and fourth days.

hours or even for a day, when the second paroxyam occurs. This is generally not so well marked as the first one, the third may be even less so, and the case may resemble more and more one of continuous fever with wide oscillations in the temperature. In some cases it is remittent at first and later becomes intermittent, but it is very rare in any circumstances that the temperature does not touch the normal point at some time in the twenty-four hours.

Enlargement of the spleen is present in the great majority of cases, and nearly to a sufficient degree to be readily appreciated by examination. The most mainfactory method of examination is by palpation. A option which can be easily felt below the ribs (except in the rare cases in which the organ is displaced deemward by some condition in the thorax) is enlarged. When it is not sufficiently enlarged to be readily felt by a practiced observer under favorable conditions for examination, it is not large enough to be of any diagnostic importance. None of the other symptoms recurring in malarial fever are characteristic; they are quite similar to those which are seen in almost all februle attacks. They are uncrexia, coated tongue, constipation, and restlessness.

Masked or Irregular Forms of Malaria.—These are quite frequent in young children, and are due to the prosence of certain special or uncommon symptoms which may readily lead to a mistake in diagnosis. They are more often seen than cases of true unlarial cachesia.

Among the most frequent of the irregular forms are those relating to the nervous extern. Headache is exceedingly common and is usually frontal. When severe and associated with continuous drowniness, romiting, and constipation, it may lead to a strong suspicion of inherentous meningitis. Vertigo is not a frequent symptom, but it is sometimes very prominent. Pains in various parts of the body are very common. A sharp, severe pain at the opigastrium is frequent at the beginning of a paroxysm. It is often associated with tenderness, but has no relation to meals. Less frequently, pain is localized in the region of the splem or liver. Aching or dragging pains in the muscles of the lower extremities are frequent symptoms during sente attacks, but may be of short duration, disappearing with the fever. The pain is accompanied by tenderness of the muscles and nerve trunks, and by loss of power, which is usually partial,

Accompanying the paroxyon of malaria there is exusionally seen, more often in infants than in older children, gents pulmonary competion (Fig. 200), which may give rise to obscure and often very alarming symptoms. There is an acute onset with comiting and preservation, high temperature, rough, rapid respiration, and often slight cyanosis. On examination of the chest there is found feeble or rule respiration over one lung, or over both lungs behind, and sometimes course most rales; these signs and symptoms may disappear in the course of a few hours with the fall in temperature, to return with the next paroxyon, or if quintin is given they may disappear entirely.\(^1\) This group of symptoms

[&]quot;The following case is a good example of this condition in its more severe form, and illustrates the difficulties in the diagnosis of malaria in infancy: A fairly nourished child, nine mostle ald, who had been under observation in an institution for two weeks was sufficiely takes with ventiting and fever (Pic. 200). A cuthartic was followed by a large sudgested stool, and as the temperature then fell to normal the attack was reported so one of inducetion. On

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has sometimes led to the mistaken opinion that the disease was preramonia, which had been aborted by the administration of quinin.

Subscute or Chronic Porms of Malaria.-The isset constant symptoms are anemia, enlargement of the sphere, and slight fever. The anemia is usually marked, often being extreme. The enlargement of the spleen is distinct, easily made out by palpation, and sometimes is very great. The fever is often so slight as to be discovered only when the temperature is taken five or six times in the twenty-four hours. The other symptoms are of a very indefinite character; there may be slight edems of the lower extremities, general muscular weakness, so that the child is easily fatigued, loss of appetits, coated tongue, constipution, buildachs, muscular pains, and often cough from a slight bronchitis. These symptoms may depend upon many conditions other than malaria, even when they are even in a malariel district. The only positive evidence of malaria in such cases is the presence of the malarial organisms in the blood. Even the swallen spicer, anemia, and slight fever, which are often looked upon as diagnostic, may be present in cases of anemia with which malaria has nothing whatever to do.

Diagnosis.—The positive diagnosis of malaria rests upon the demonstration of the malarial organisms in the blood. They will be found in acurly all the cases provided a careful examination is made a few hours before the purceyon, and also that no quinin has been administered. When their number is small they may be missed at the height of the fever, although they may readily be found just before the temperature begins to rise. While a positive result is conclusive, a negative one is not always so because of the impossibility of fulfilling all the above conditions. This fact and lack of experience in blood examinations make it necessary for a large part of the profession to make the diagnosis by the

the third day the temperature was ugain high and accompanied by rough; coarse riles were found throughout the rhest, and fine niles at the right base; it was then thought that passimonia was developing. On the fourth day all the symptoms were so much improved that the infant was regarded as convalescent. At 6 car, the temperature was normal, and the infant went to sleep quietly. At 9.30 P.M. he broke with a temperature of 104° F, extreme restlement, and marked dyspace. In half an hour his symptoms had increased to a point where he seemed likely to die. He became cyanotic, the respections were of a pasting character and rose nearly to one hundred a mireste, and he coughed with almost every breath; the pulse was scaredy perceptible. The secret symptoms contimed for about an hour, then passed away gradually, and at the end of two and a half hours they had completely disappeared, and the child was in a quiet sleep which continued until morning. Maleria was now suspected, and the diagtools established by the discovery of the organisms in the blood. The spicen was at this time much enlarged; the signs in the sheet were those only of brone shifts of the large tubes. Quinin was given in full doors, and immediately controlled the temperature and the pelessensy exceptome.

other symptoms. These, in the order of their importance, we would place as follows: Prompt curability (especially in cases of fever) by quinin; distinct periodicity in the symptoms; enlargement of the spicen; and a history of an exposure in a district known to be undarial. Particular importance is to be attuched to the therapeutic test. Recent experience emphasizes more and more strongly the fact that quinin has very little influence upon fevers which are not malarial, and, conversely, that a fever immediately and permanently controlled by quinin is pretty certain to be malarial.

The fever and recurring chills of pyelitis are often attributed to malaria. Many conditions accompanied by an enlarged spleen may be confounded with malaria, especially simple anemia, leukemia, rickets, and syphilis. While malaria may be multiform in its manifestations, the physician can fall into no more serious error, even in a malarial district, than to regard all allments with obscurs or indefinite symptoms as malarial, neglecting careful physical and blood examinations, by which means above an accurate diagrassis is reached.

Prognosis.—Although it is seldon fittal in itself, an attack of unitaria in a young child may so undermine his constitution that he may excumb to some other acute disease. Cases are often difficult to core while the patient remains in the unitarial district, and when frequent re-infection covers. In other circumstances and with proper treatment the prognosis of mularia is good.

Treatment.—Prophylar is.—More exact knowledge regarding the etiology of sularia makes it possible for much to be done in the way of presention. Besides the general measures proposed for the externimtion of the mosquitoes conserved, emphasis should be laid upon the necessity, in the case of young children, of protecting them against the bets of mosquitoes in localities which are or which may possibly be malarial. This can be done by a more thorough use of mosquito notting and by using upon exposed pasts of the body letions or ointments containing menthol, pemyroyal, terpentine, or other substances which keep these posts away. The general treatment is symptomatic, and is to be conducted as in all newle febrile discusses. In the cold stage, stimulants or a hot both may be required; in the hot stage, ice to the head and frequent sponging.

Methods of deministration of Quinis.—For infants our own preference is to give the sulphate in an aqueous solution, two se five grains to the temporaful, according to the age of the patient. Most infants take so is a solution with less difficulty and sensit it less frequently than the combinations with the various vehicles supposed to cover its taste. If the quinin is given at night upon an empty stomach, vomiting seldom occurs. If repeated vomiting makes it impossible to give quinin by

mouth it may be given hypodermically. For this purpose the bimuriate of quinin and uses is perhaps the most satisfactory preparation; but the bisulphate may be used. Both are more or less tritiating and there usually follows some induration at the site of the injection, which may last a long time. While the hypodermic use of quinin is sometimes invaluable it should not be employed in infants avcept in serious attacks and when the diagnosis has been established. The frequent repetition of the hypodermic injections should be avcoded; in most cases, two or three good does are sufficient, the effect being continued by quinin given by other methods.

For children from two to seten years old the taste of quinin must be concealed. An aqueous solution of the bisulphate may be mixed with the syrup of sarsaparilla, orange, or yerbu sents; or the sulphate may be given in suspension in one of the same vehicles, the mixture being made just before the dose is taken; otherwise the partial solution of the drug will render the whole dose exceedingly bitter. When the dose required is not large, as in the milder cases, the losenges of the tannate of quinin continued with chocolate answer the purpose admirably, for these are so nearly tasteless that children will take them without difficulty. Each losenge usually contains one grain of the tannate, which is equivalent to about one-third of a grain of the sulphate of quinin. A similar losenge containing one grain of the sulphate may be made, which is often taken by children without the slightest objection.

For children over seven years old, the same methods of administration may usually be coupleyed as in adults. It is always preferable to give quinto in solution, or if not so, in capoule, but not in pill form.

In a case with well-marked paroxysms the quinin should if possible be given in the interval, with the largest dose about four hours before the expected paroxysm. With infants this plan is sometimes impracticable, as frequent small doses are usually better borne by the stomach than a few large ones. In them also comiting seems less likely to occur when it is given on an empty stemach. For this reason it is advantageous to give the drug at regular two- or three-bour intervals during the night, and emit all medication during the day.

Dasage.—Relatively much larger doses of quinin are required for young children than for adults. Except for its tendency to disturb the stomach, quinin is beene remarkably well by little patients. Generally too small doses are given. An infant of a year with a sharp attack of malarial fever will annally require from eight to twelve grains of the sulphate (ten to fearteen grains of the bossiphate) daily. Overseonally we have found it necessary to give doubte the quantity referred to. It is useless to expect to control an acute attack of malaria by such doses as one grain three or four times a day. Children from five to len years old require almost as large doses as do adults. None of the substitutes for quinin are to be relied upon in acute cases.

In chronic cases, arsenic and from are usually required in combination with smaller dozes of the quinin than those mentioned. For children over seven years old, Wariourg's fincture may be employed. In most chronic cases a cure can be effected only by a change of climate,

The masked and irregular manifestations of malaria are to be treated in the same manner as cases of malarial fever,

SECTION X

OTHER GENERAL DISEASES.

CHAPTER I

RHEUMATISM

RESERVATION manifests itself in children by quite a different group of symptoms from those seen in adults; for this reason the disease was formerly supposed to be a rare one in early life. It is only within recent years that its frequency and its peculiarities have come to be appreciated. For our present understanding of the subject we are indebted largely to the work of English physicians, especially Cheothe, who has brought out more fully than any one else the close connection existing between many conditions formerly not regarded as rheomatic. One who has in mind only the edult types of articular rheamatism, and regards arthritis as a necessary symptom for a diagnosis, will overlook in early life many manifestations which are clearly the result of the rhounstic prison. There is som at this period a group of clinical phenomena, which often occur in combination or in succession, whose association was not understood until they were all discovered to be related to rheumatism. Sometimes one member of the group and senetimes another is first seen, but when one has appeared others are likely soon to follow.

Rhemation in childhood, then, is manifested not alone by arthritis with acute or subscute symptoms, but by a large number of other conditions which are not to be regarded in the light of complications, but rather as forms of the disease.

Etiology.—It is not in the province of this work to discuss the various theories regarding the nature of rheumatism and its exciting cause. The drift of medical opinion to-day is strongly toward the view that acute rheumatism is an infectious disease, probably of microbic origin. Although the character of the microbriganism is not yet satisfactorily determined, the observations of Poynton and Paine, Wassermann and others point to a diplococcus. Under five years of age articular theumatism is not common, and in infancy it is extremely rare. We once saw, however, in a nursing infant, a typical attack of rheumatic fever with

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multiple joint lesions. The condition is, however, so exceptional that one should be cautions in making the diagnosis of rhomatism in infancy. Most of the cases so regarded are examples of scurvy. After the fifth year both the articular and the other manifestations of rhomatism become very common, and occur with increasing frequency up to the time of puberty.

Herebity is a very important etiological factor, and in fully twothirds of the cases that have come under our care, a thermatic family botory was obtained. Of the other important causes, the most frequent, are living in damp dwellings, direct exposure to cold and wet, posshygicaic surroundings, and insufficient food. While seen among all classes, rheumatism is more common among those who are hally housed. Attacks of rheumatism occur at all sensons, but are much more frequent in the spring months. One attack strongly predisposes to a second, and in most cases there is a history of a large number of attacks of greater or less severity. Among our own patients, girls have been affected with greater frequency than boys.

Symptoms. The General and Articular Manifestations. The clinical types of rheumatism in children present very notable contrasts to those seen in adults. A typical attack of acute articular rheumatism such as is seen in adult life, with a sudden paset, high temperature, severe inflammation of several joints, profuse acid perspiration, and occasional delirium, is rarely seen in a child under eight or ten years old. In most of the attacks in childhood the easet is not very acute, the temperature is but slightly elevated-only 100° or 101.5° F .- the swelling and pain are moderate, and the redness is often absent. The number of joints involved is generally small, those most frequently affected being the ankles, the knees, the small joints of the foot, the wrists, or the ellows. These symptoms are often not severe enough to keep the patient in hed, and only the pain in the joints of the lower extremities prevents him from walking. The denstien of these attacks is from one to three weeks, and in the course of a month most of them recover even without treatment.

Not infrequently the symptoms are limited to a single joint, neually the hip, knee, or ankle. Possibly the joints of the upper extremity are affected oftener than would appear, but disease here is much more likely to be overlooked than when lameness is present. The swelling is moderate and may not be evident except on a close examination; in some cases there is none. There is stiffness of the joint, as shown by lameness, and there may be so much pain and screness that the child refuses to walk altogether. Muscular spasm about the affected joint is often marked, and may be the most striking objective symptom. The tenderness is sometimes localized, but it may affect the ligaments, tendons, and even the nurseles. These symptoms may persist for two or three weeks and lead to a empirion of incipient tuberculous disease of the joint. Elementism is distinguished by its more scate smet and usually by the presence of slight fever; some elevation of temperature being the rule, though it is not often much over 100° F. A family history of rhoumatism, or a history of previous similar attacks in the patient affecting the same or other joints, or other manifestations of rheumatism, are also of assistance in the diagnosis. Occasionally all doubt is removed by the disease extending to other joints, or by the development of endocarditis. In some cases the symptoms are less in the joints themselves than in the muscles, and they are frequently dismissed as samply "growing pains," having nothing characteristic about them except their occurrence in damp weather.

Cardisc Manifestations.—These may occur when the articular symptoms are very mild, and in some cases when they are entirely absent. The most frequent is endocarditis. This is much more often seen in the acute rheumatism of children than of adults, and probably occurs in the majority of all severe cases; if it does not come in the first attack, it is likely to be seen in the later case. It frequently occurs with a mild rheumatic arthritis, often being unnoticed until valvular disease of considerable severty has developed. Sometimes there is only high fever with severe constitutional symptoms of an indefinite character, but no arthritis, and no suspicion that the attack is rheumatic until endocarditis is discovered. Such cases are not infrequent. If the patients are kept under observation, articular symptoms are almost certain to develop later, and often there are other manifestations of rheumatism, especially chores.

Pericarditis is much less frequent than endocarditis, and usually occurs in children over seven years old. It is often associated with endocarditis. The most characteristic form of inflammation in early life is a sub-acute, dry. Ehrous form, often resulting in great thickening with extensive adhesions, and frequently in olditeration of the pericardial and. When once started it slows a strong tendency to recurrence and persistence.

The heart is so frequently affected in the rhounatism of childhood that it should be closely watched whenever articular symptoms are present, no matter low mild they may be; and not only in those cases, but in all the conditions hereafter enumerated with which rhounatism is likely to be associated.

Informassions of other across membranes—the plears, peritoneum, and pix mater—were much more frequently ascribed to the mutiem in the past than now. There is reason for believing that on rare occasions the plears may be involved, but very exceptionally in young children.

There is no evidence that the peritoseum and morninges are directly

affected by rheumatism.

Torticalize when it occurs anotely is frequently rhousantic. This form is characterized by its endden development, continuous spasm, the great amount of muscular screness, the moderate pain, and the fart that it notally disappears spontaneously after a few days. Other manifestations of muscular rheumatism are less characteristic and usually affect the muscles of the extremities.

Ascenia is almost invariably seen in rhoumatic patients, both during and between the attacks. The effect of the rhoumatic poison upon the blood resembles that of maleria. A secondary anomia develops, often

of considerable severity.

Chorest.—In the chapter upon Chorea we have already discussed the association of that disease with rhermatism and expressed our belief in a very close relationship existing between them. Not infrequently charea is the first manifestation of a rheamatic disthesis, to be followed soon by articular symptoms or by endocarditis without such symptoms. In other cases chorea and acute endocarditis occur together without articular symptoms, or all three may be associated. Whichever of the three conditions is first seen, the physician should always be on the lookout for the others. The frequency of rheamatism in cheesic patients has been variously estimated by different observers; in our own cases over fifty per cent have given unmistakable evidence of a rheamatic diathesis.

Tossilliris.—The association of tonsillitis and pharyngitis with rheumation appears in many cases to be a close one. Children who are the subjects of frequent attacks should be regarded as probably rheumatic, and closely watched for other signs of that disease. Acute tonsillitis often ushers in an attack of rheumatic arthritis, and occasionally acute endocarditis without articular symptoms. The nature of the relationship is not yet fully explained; by many the tonsils are regarded as the structures in which the organisms of rheumatism first obtain a feethood.

Subsulencess Teadiness Number.—General attention was first drawn to those as a manifestation of rheumatism by Barlow and Warner, in 1881, who described them as "aval, semi-transparent, fibrous bodies like boiled sago grains." They are most frequently found at the back of the ellow, over the malleoli, at the margin of the patella; occasionally on the extensor tendors of the hands, fargers, or toes, or over the spinous processes of the vertebrae or the scapular. They are composed of fibrin, cells, and fibrous tissue, and vary in size from a large pin's head to a small bean, sometimes being as large as an almostd. The nodules may come in crops, lasting for a few weeks and then desappear, or they may last for months. An eraption of nodules is usually coincident with other

rhoundle manifestations. These assistes are letter felt than seen, although they may be visible if the skin is tightly drawn. They are certainly not common in this country; and although we have made it a rule to examine rhoundir patients for them, we have seen them but selding, and they have been prominent in only eight or ten cases. This has also been the experience of most observers in this country. From published reports, however, they appear to be much more frequent in England. There can be no doubt regarding the connection of these nodules with rhoundation.

Erythems.—The connection between rhoumatism and the various forms of crythems—marginatum, papulatum, and nedosum—has been very clearly shown by Chendle. None of these is a frequent condition in childhood, but when seen it should always suggest rhoumatism.

Purpare.—The association of purpara with rheamatism is at times so close that there can be little found of the close connection between the two conditions. Rheamatic purpara, however, is quite distinct from the other forms of purpara, and is a much less frequent disease.

Diagnosis. In order to resegnine elementism in a child, one must free his mind from precenceived notions of the disease drawn from its manifestations in adults, as very few cases correspond to the adult type of acute theumatism. In early life the disease is recognized not by any one or two special symptoms, but by the association or combination of a number of conditions which may appear unrelated. In determining whether or not any given set of symptoms is due to rheumatism, one should consider: (1) the family history, since in early life heredity is so important an etiological factor; (2) the previous history of the patient, not only as regards articular pains and swellings, the slight joint-stiffness without swelling, the indefinite wardering pains in damp weather, and the so-called growing pains, but also the previous existence of chores, frequent attacks of tonsillitis, torticellis, or crythems; (3) the examination of the patient, which should include a careful search for feudinous nodules, as well as a thorough examination of the heart for signs of endocarditis or pericarditis, and, in cases which are at all acute, the temperature. In doubtful cases with manarticular symptoms much importance is to be attached to the presence of slight fever, the abropt onset, and tenderness of the neighboring muscles and tendens-all occurring without a history of transaction. Rhoumstiam is more often overlooked than confounded with other diseases; although in childhood multiple neuritis and tuberculous and syphilitic bone disease are often mistaken for it, and in infancy the same is true of scurry. The extreme infrequency of rheumatism during the first two years of life should always make one sceptical regarding it. In an infant, when the symptoms are confined to the legs and are not accompanied by fever, they

are almost certain to be due to scurvy, even though the gums are normal and exchymoses have not appeared. Multiple geneceeous arthritis has often been diagnosticated rheumatism. Many cases of general sepsis, especially such as originate from the torsils or the teeth, may be accompanied by joint swellings resembling rheumatism.

Programs.—Rheumatism in a child is in stacif school if over dangerous to life. In the great majority of cases the articular symptoms seen imappear, even without special treatment. The danger from the disease consists in its cardiac complications. One attack of rheumatism is almost certain to be followed by others, and when once the heart has been affected it besions are likely to increase with each recurrence of the disease.

Treatment.—Rheumatism in children derives its chief importance from its relation to cardiac disease. Cardiac complications are so frequent and so senous that everything possible should be done to avera rheumatism from those who by inheritance are especially predisposed to it, to prevent its recurrence in a child who has once had the disease, and during an attack to prevent the heart from becoming involved. The relation of diet to rheumatism is very imperfectly understood. Our own opinion is that there is no close connection between the two. The understoodning should be of wool during the entire year, in summer the lightest weight being worn. The feet should be carefully protected, and exposure in damp weather avoided. Indoor occupations should be chosen for rheumatic boys.

The tendency to recurrence is an strong in this disease that a child of rheumatic autecelents, who has shown in the various ways mentioned a marked predisposition to rheumatism, and who has had an attack, even though a mild one, should, if possible, spend the winter and spring in some warm, dry climate, or even remain there permanently. Otherwise in most such children, it is only a question of time when, with the repeated attacks, the heart will become involved.

To avert the danger of surface complications during an attack of rheumatism, or to limit their extent, there are two things which should invariably be insisted on: first, to confine to the house and in a warm room every child with rheumatic pains, no matter how mild; accordly, if fever is also present, to keep the child in boll while it continues, even though it may not be above 100 Ű F. Absolute rest and the equable temperature thus secured are unquestionably of more importance than anything else in protecting the heart during a rheumatic attack. With these premations must be remained an early diagnosis. In very many, perhaps in most cases, the harm is done before the true mature of the disease is suspected, the symptoms being dismissed as of slight importance because the articular manifestations are not very severe. Children who have once had cheumatism abould be closely watched during chores and other diseases related to rheumatism, the heart should be frequently examined, and the physician should be on the alert for the first articular symptoms.

Aside from the measures just mentioned, the treatment of rheumatism in childhood is to be conducted very much like that of adult life. In most acute attacks either salicylate of soda (gr. v every three hours to a child of five years), aspirin, of of wintergreen, or salicin should be given; as the majority of cases are not very acute, marked improvement is by no means always obtained by these drugs. Alkalia should be given in all cases in combination with the salicylates, but particularly in those in which there is hypermicity of the urine. Either the acetate or citrate of potassium or the locarbonate of sodium may be used, a sufficient quantity being administered to render the urine alkaline.

Quite as recessary as these drugs is the use of general tonics, particularly iron and cod-liver oil. These should be given not only between attacks to fortify patients against their recurrence, but also in subscute cases which are sometimes influenced very little or not at all either by salicylates or alkalis.

The importance of attention to pathological conditions in the tomils and mouth in all children with recurring rheumatic attacks should not be overlooked; repecially should diseased tonsils be removed and carrious tooth and diseased goes receive appropriate treatment.

CHAPTER II

DIABETES MELLITUS

Ly this chapter will be attempted only a description of the peculiar features which diabetes presents whom affecting young patients. It is a rather infrequent disease in children. Of 1,360 cases of diabetes collected by Pavy, only eight were under ten years of age. In a series of 200 cases collected by Prout, only one case was under ten years. In a series of 380 cases collected by Meyer, only one case was under ten years of age. More recent statistics have shown that the proportion of children under ten among diabetics is not so small as would be indicated by these figures. Von Noorden has reported 84 cases in children under ten in about 3,000 cases of diabetes. We have ourselves seen more than thirty cases.

Etiology.—Stern, in a series of 117 collected cases of diabetes in children, states that 47 were females and 31 males, the sex in the other

cases not being given. Of 26 of the cases observed by us, 16 were in females and 10 in males. It seems that females are rather more frequently affected, in contrast with the marked preponderance of cases in males in adult life. Although extremely rare, cases have been observed during the first year of life. Statistics on this point are not altogether trustworthy, since some cases of temperary glycosuria have certainly been included. The youngest case that has come under our observation was in a boy of twenty-six months.

Among the stiological factors heredity is one of the most important. Pavy reports the case of a child dying of diabetes at two years in whose family the disease had existed for three generations. Instances have been recorded of the occurrence of diabetes in four or five children of the same family. There was a family history of the disease in 11 and of 24 patients under our care. Several of the cases reported in children have been preceded by injuries received upon the band. In a number of our own cases the disease has followed the consumption of large quantities of sugar for a long time. Often no adequate cause can be found.

Symptoms.—The most important early symptoms are thirst, polyuris, and wasting; their development is often quite rapid. The thirst is intense, often builing duldren to drink four or five pints of fluid a day, or even more. The amount of urine passed varies from one to eight quarts daily. The specific gravity is from 1.026 in 1.040, and the amount of sugar usually large. Acetone discretic and β-axybutyric acids are also present in greater or less amount. Albumin is not infrequently found Incontinence of name is an important symptom, and often one of the earliest to be noticed. The susting is usually quite rapid, so that a child may lose as much as six or eight pounds in a month. It is generally accompanied by anomia. The appetite may be poor; at times, however, it is toracious. Other symptoms of less importance are a dry month, scanty perspiration, irregular sloop, occasional opistaxis, furnishes and abscesses, decayed teeth, and genital irritation.

The course of the disease is much more rapid in children than in adults, and, as a rule, the younger the child the more rapid its progress. Without proper treatment, the great majority of the cases prove fatal in from three to six months from the time the symptoms are sufficiently marked to make the diagnosis possible. Occasionally, however, one of the milder type may be prolonged from one to two years.

The progress of the disease is marked by continuous wasting, which may result in a striking degree of malantrition and prove fatal. Some are carried of by intercurrent pneumonia or tuberculous, but the majority die comutose. When come develops, the case may be considered hopelous, and death is likely to be postponed but a few days. The cause of diabetic come has not been explained with entire satisfaction. It occurs when there has been a prolonged and severe drain upon the alkaline defenses of the body by the abnormal acids which are not, in themselves, directly posiciones. Acidosis is a regular accompanionent of come. Whether it is the sile came is at the present time not entirely olear.

Diagnosis.—Diabetes is upt to be overlooked, because of the conmon neglect of urinary examinations in whildren. The prominent symptoms,—thirst, polyaria, and wasting—when associated, should always attract attention. Encresis, accompanied by marked wasting, is always suspicious. In some cases genital critation may be the most prominent early symptom. A positive diagnosis is made only by an examination of the uring.

Prognosis.—In few diseases has the prognosis been to had at in diabetes in children. Senator has doctared that diabetes in children is hopeless and all treatment meloss. Von Noserlen has said that with rare exceptions diabetes of childhood allows no respite. Such has also been our experience. From the more recent methods of treatment, especially that recommended and subscrated by Allen, much more is to be expected. It has been sufficiently demonstrated that children can be maintained in a satisfactory condition, free from sugar and gaining gradually in weight for many months. We have now mater observation five children who are doing well. Whether it will be possible for them to continue in this way and to reach adult life properly developed is a matter which only the future can decide. The outlook is, however, not so immediately dark as it has been. Intelligent observation and unremitting cure are required both by the physician and parents. Without them good results are impossible.

Treatment,—The indications for treatment are the same in children as in adults. Nothing more can be indicated here than the principles to be followed. In diabetes the carbohydrate information is always very greatly diminished but usually not entirely last. The purpose is to increase this tolerance. It can only be accomplished by protecting the carbohydrate mechanism from overstrain. If the telerance is exceeded and sugar is exceeded in the urine, the carbohydrate mechanism becomes less and less capable and the telerance sinks. By protesting sugar excretion the mechanism improves and the tolerance rises. Patients should therefore be rendered sugar free at the earliest possible moment and constantly maintained sugar-free. This may be accomplished by temporary starvation until no sugar appears in the nature. Nothing whatever by month should be allowed but clear broth and water. When there is no sugar exceeded, well-cooked regulation may be given, at first those contaming but little carbohydrate, so in as asparague, spinach.

cablage, enions and celery. After two or three days, nitrogenous foods, eggs, meat or fish may be allowed and later bucon, butter, slive oil and other fats. All of these are to be given in small amount at first and gradually increased until the nitrogenius and valoric needs of the body are satisfied. Loss of weight at first is to be expected and is not to be feared. Carbohydrate tolerance and not the weight curve is the index of progress. It is important that a record should be kept of the amount of carbahvdrate taken and of the amount of sugar and acetone bedies excreted in the urine. Not more than 10 grams of carbohydrate a day should be given at first and any increase should be slowly made. Even if no sugar appears in the urine, it is advisable in sovere cases to introduce a day of only booth feeding every ten days or two weeks, after which a law carbohydrate diet should be instituted and the carbohydrates again gradually increased. From time to time an attempt should be made to introduce articles of food such as cutmenl and milk in small quantities but never in amount sufficient to cance glycosuria. If sugar appears, a rapid and great reduction in the carbohydrates of the food is to be mole and any increase should be instituted with rantion, and not for several weeks should the amount be reached which was formerly followed by glycosuria.

CHAPTER III

PELLAGRA

ALTHOUGH it is only recently that pellagra has attracted much attention in this country, it is not likely that it has existed here for only a for years, but rather that it has not been recognized. At the present time its etiology is not understood. Three theories as to its cause have been advanced. The first and the one longest held is that it is due to the cating of spoiled corn (mains). In this, taxic products are supposed to be produced by the growth of fungi or of bacteria. The second is that it is a purasitic disease transmitted by the bits of an insect (the guat). The third, and the view which is becoming more and more widely accepted, is that it is due to a diet deficient in certain important constituents (vitamins), which places it in the same group as scurry and beriberi. The recent observations of Goldberger have shown that recurrences of the disease may be prevented by a reduction in the amount of carbohydrate food, and by considerable increase in vegetable and animal proteins, especially fresh milk, eggs, ment and legiminean regetables. His observations indicate that pellagra may be produced by giring a dict which, though abundant, may counist chiefly of carbohydrates and from which fresh animal and vegetable proteins have been excluded.

Pellagra is seen at all ages although it is comparatively rare in very young infants. After two years of age it is much more common. It is found with greatest frequency in the states of the South Atlantic Coast, although cases have been reported from almost every state in the Union and even from Canada. Pellagra is a disease precunisently of the warm mouths,—spring, summer and autumn. As soon as cool weather comes it usually diminishes much in acceptly and in frequency, but cases sometimes develop even during the winter. It is found chiefly among the poor living in uneasstary surroundings, but no class is entirely exempt. While it is found in cities as well as towns, it occurs more often in country districts.

There are no characteristic anatomical lesions in pellagra. Cellular change in the brain is common. In the cord degeneration of the lateral and posterior columns is frequently found, but usually only in cases that

have existed for many menths or years.

Symptoms.—The symptoms in a well-marked case are easy to recognize, but in the mild form the disease may be almost impossible to detect. and it may be a long time before a definite conclusion as to the diagnosis can be reached. There are three chief symptoms—the cutaneous lesions, the gastro-intestinal symptoms and those of the nervous system. The cutaneous or the gostro-intestinal symptoms are these first in evidence. The graption is found chiefly on exposed surfaces and for this reason and because it often begins with the advent of warm weather, it is frequently mistaken for sunburn. The cruption begins as an crythema, but after a variable length of time exfoliation takes place, desquamation being in some eases very marked. The skin is thirkened, rough and dry, although in exceptional circumstances vesicles and fullar may be found and obseration even may take place. The eruption (Fig. 201) is found upon the hands, neck, face and feet, although it may spread far up the arms and legs and involve even portions of the trunk as well. It is strikingly symmetrical and the lesions are sharply sutlined; when they are not so it usually indicates that the cruption is receding. There is a certain amount of brownish discolaration, its intensity depending somewhat upon the complexion of the person affected. No itching is complained of, but a slight huming or tingling sensation. The nails are unaffected. The tongue is oftentimes red; it may be coated, with clear edges, or it may be dry and glased. The papillae are often somewhat enlarged. The tongue may be seedlen. In addition to the glossitis there may be also stematitis and gingivitis. Burning in the mouth is an occasional complaint.

The gastrie symptoms are few. Vamiting is rare. Anarchia may be marked but at times there is a craving for unusual food. Diarrhea la the rule. The stools are from two or three to as many as fifteen a day. They may be watery, but at times mucus and even blood are present. Peolonged constitution as rare, but the dearnhea often alternates with periods of constitution.

The mental symptoms are not so marked in children as in adults.



Fro. 201 .- Pentagen. Boy, five years sid; died of the discuss five months later.

Depression is aften present. There is frequently a change in disposition, the children becoming dull, merose and poerish. An anxious, distressed facial expression is characteristic of marked cases. The reflexes are usually exaggerated. Ankle clonus is frequently present and there may be a decided tremor upon exertion. If the intestinal symptoms are marked, there may be great loss of weight. The progress of the symptoms is not usually continuous, but there are marked remissions and exacerbations. The disease often disappears in the full and winter to return

again the following spring and this may be repeated many times. It is for this reason difficult to say when the disease is really cured. The prognessis in children is better than that in adults but death may occur from a continuance of the diarrhea, from this development of marked malnutrition or from intercurrent infections.

Treatment.—No specific renerly for the disease has get been discovered. The gastro-intestinal condition should be treated symptomatically. Pellagrous methers should not nurse their infants. They should be artificially fed or a wat-nurse should be secured. In children beyond the nursing age the diet should be a mixed one, suited to the age of the child so far as the gastro-intestinal symptoms will allow. Following the suggestions derived from Goldberger's observations, careful attention should be given to the food. A faulty diet in which carbelpitrates, especially some meal, have been excessive should be replaced by one with an abundance of milk, eggs, frost ment, pass and beans. The patient should be put in the best hygienic surroundings possible. Amenic is believed to be of special value. It may be given by mouth in the form of Fowler's solution, but it is thought by many to be more effective when given hypodermatically. Soliton emostylate may be used in does of 1/12 to ½ grain repeated two or three times at intervals of several days.



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